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THE QUARTZ LAMP

Ultra Violet Light — Quartz Light Therapy

Published by THE ALPINE PRESS, INC. Newark, N. J. U. S. A.

For { British Hanovia Quartz Lamp Co., Ltd., Slough, Bucks, England. Quarzlampen Gesellschaft, m. b. H, Hanau, a. M., Germany. Nippon Hanovia Sekiei Dento Kabushiki Kaisha, Tokio, Japan. Hanovia Chemical & Mfg. Co., Newark, N. J., U. S. A.

VOL 4 No. VII. JULY, 1926 ISSUED MONTHLY

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ARTIFICIAL SUNLIGHT IN TREATMENT OF INTERNAL TUBERCULOSIS IN JAPAN.

Successful treatment of internal tuberculosis by means of artificial sunlight is reported. In Japan it is impossible to use natural sunlight on the high mountains as is done in Europe, since the mountain peaks are always covered with heavy clouds.—*Therapy of Internal Tuberculosis by the Use of Artificial Sunlight, S. Ohsato and K. Watanabe, Tokyo Ijishinshi,* 1925, *no.* 2404, *Abstract from Japan Medical World,* 1925, *v,* 68.—(*M. M.*)

BLOOD CHEMISTRY AND ULTRAVIOLET RAYS.

The blood-chemistry changes resulting from ultraviolet radiation take place principally in two ways: first, through absorption of radioactivity from the rays by the red blood cells while circulating near the surface of the body upon which the rays are falling, and the carrying of radioactivity to certain glandular structures, thus influencing the hormone function; second, through the reflex action of the rays on certain cutaneous nerve endings which play a part in the physiological activities of the body. In both instances the ultimate results appear to influence physiological processes rather than to directly affect the blood itself. However, the action of the rays has a tendency to increase the calcium content of the blood. If this is above normal ultraviolet-ray therapy is contraindicated. If the pigmentation of the skin is progressive, as a result of ultraviolet-ray exposure, it is an index of defense against excessive blood-chemistry changes. If pigmentation does not take place after a considerable period of exposure, one may rest assured that such changes are more or less immaterial and may be disregarded. Pigmentation, therefore, may be used as a partial guide in this respect. In the case of tuberculous patients, the chest is covered if the condition involves the lungs. A series of cases are reported showing the beneficial effects of ultraviolet-ray therapy in pulmonary and extrapulmonary tuberculosis and eczema.—*A Further Study in Blood Chemistry and the Results of Ultraviolet Ray Therapy in Certain Tuberculous and Other Cases, F. A. Davis, Med. J. & Rec., August* 19, 1925, *cxxii,* 188.—(*J. S. W.*)

THE EFFECT OF IRRADIATION OF ULTRAVIOLET ON THE PROTEIN AND PURINE METABOLISM OF MAN.

Weiner, Klin. Woch. Schr. 3, 936 (1924).

Nitrogen and phosphorus excretions are decreased, sulfur metabolism is unchanged. The resulting effect of light is the storing of protein. Purine metabolism is not altered apparently. General irradiation leads to the demobilization of the uric acid deposits of the body with general increase in elimination.

CLINICAL INDICATIONS FOR ULTRAVIOLET LIGHT IN SKIN DISEASES.

Moses Scholtz, M.D., Los Angeles, Calif.

TECHNIC AND DOSAGE.

The factor of dosage and technic deserves proper consideration. Commonly, the importance of the exact technic and mechanically measured dosage is emphasized as a paramount factor for successful results.

I take a somewhat different view of the subject. In my opinion the prevailing custom of following rigidly the exact formula and dosage of a physiotherapeutic agency in application to an individual case is biologically unsound and is not conducive to the best clinical results.

X-ray and radium are the only exceptions which allow the least amount of deviation from the standard dosage. In all other physiotherapeutic agencies, the individualization of the doses is the most important factor before the clinician.

To begin with, we have as yet no ways of exact measuring the intensity and the amount of ultraviolet light radiation. So far it is measured in terms of a skin reaction erythema or blistering dose. There are two factors militating against the efficiency of a mechanical measurement of the dose.

The first is the individual variations of the burners which may vary considerably in the intensity and volume of radiation. Each operator has to study his burner and make out the measuring chart of his individual burner.

The second and a still more important factor is the variation of individual skin in tolerance and sensitiveness to actinic energy.

The skin is an extremely individualistic organ. It presents a tremendous range of variations in sensitiveness to all kinds of therapeutic agents—drugs or physiotherapeutics.

Variations due to actinic tolerance of various parts of the body, variations due to age, sex and complexion of the patient and variations depending on the differences in clinical types of the skin lesions should all be considered in estimating the dosage. Also the possibility of a true hypersensitiveness and idiosyncrasy should not be forgotten.

Because of these numerous factors making for the individualization of the dosage, I believe a clinician should not adhere to any exact and mechanical formula of a dosage, but measure his actinic energy in terms of full or fractional erythema dose estimated for his individual burner and in full accord with the clinical requirements of the individual case.

TINEAS.

Another vast field of clinical application for the ultra-violet light is presented by the group of tineas. The frequency, the wide dissemination and the variety of the clinical types of tineas are not sufficiently appreciated by the average practitioner.

The old fashioned "ringworm" is the least important, not only clinically but even numerically. The extremely common and resistant to medication forms of tinea cruris and axillae, at least in typical cases, have been recognized for a long time.

But the latest research has brought out and established the clinical identity as tineas of a numerically enormous group of lesions which were regarded by the general profession as intertrigos or plain eczemas. These are the interdigital, palmar and plantar, vesicular and squamous forms of epidermophytosis.

The frequency and wide dissemination of this type of tinea is truly appalling. In superficial vesicular and scaly types of epidermophytosis ultraviolet light is sufficient to destroy fungi. In deeper types for the reasons explained above a preliminary cleansing and peeling is necessary. I prefer to precede the ultra-violet light radiation by bathing in a hot saturated solution of Epsom salts, followed by antiseptic and keratolytic salves.

Here again I wish to emphasize the value of the ultra-violet light not only in destroying the accessible fungi lying on the surface, but what is more important in inhibiting bacterial and mycotic growth and preventing recurrences through destroying individual fungi and mycelia on the apparently healthy skin adjacent to the affected areas.

No application of antiseptic ointment can compare in efficiency with a perfect uniform diffusion of the ultra-violet light over the entire affected area. This factor is particularly important in the interdigital, crural and axillary types, where the affected surface presents so many nooks and corners defying a perfectly uniform distribution of the antiseptic ointments.

In ringworm of the scalp, the ultra-violet light cannot be of curative value because it cannot penetrate to the hair roots, the seat of the infection. Yet it is useful in reducing the number of mycelia on the surface of the skin, thus supplementing the deep effect of antiseptic applications. Even in cases treated by X-ray the ultra-violet light is very beneficial in the postepilative stage, both for the purposes of sterilization of the scalp and the prevention of recurrences, as well as the stimulation of the hair regrowth.

The technic of radiation is somewhat different from that used in streptodermias. The dosage used is much stronger as the skin affected by tinea is far less irritable than a streptodermic skin. A full erythema and even blistering dose is permissible in sluggish and chronic cases. However, the general principle of dermatologic therapeutics should be kept in mind, *i. e.*, the more acute the stage of infection is the milder the medication or physiotherapeutic agency application should be.

TINEA VERSICOLOR.

The most clearly cut indication for the ultra-violet light in mycotic dermatoses and one in which perfect results are obtained by it alone, is presented by tinea vesicolor, closely related to other types of tinea, but characterized by extreme superficiality, chronicity and tendency to attack large areas of the body. Blistering or at least full erythema doses are indicated.

PITYRIASIS ROSEA.

I want to include here pityriasis rosea because I share the belief of the German school in its parasitic origin. Ultra-violet light not only relieves the itching often present in this dermatosis but also shortens very considerably its duration. I prefer mild radiations, two or three times a week, supplemented by mild antiparasitic ointments.

SEBORRHEA AND ACNE.

Seborrhea offers a large field of clinical application for the ultra-violet light. The exact value of ultra-violet light in seborrhea can be best estimated from a clear understanding of the pathogenesis of seborrhea.

Seborrhea is a metabolic condition controlled by endocrinous, digestive and dietetic factors. The bacterial element in seborrhea is due to a secondary invasion by the bacillus seborrhea and staphylococci. This being the case it is clear that ultra-violet light can be helpful in seborrhea only partially by clearing up the

acne lesions through its bactericidal, stimulating and superficially keratolytic action. It is also clear why ultra-violet light cannot compare with the X-ray in permanency and depth of the effect on acne lesions, as the X-ray checks and inhibits directly the activity of the oil glands. It also explains why the local treatment must be supplemented by various systemic measures, such as dietetic corrections, increase of elimination, etc. In spite of the above cited limitations ultra-violet light is extremely useful in acne. I believe that the local treatment of acne should be started with ultra-violet light and only in deep, indurated cases with a tendency to early recurrences should X-ray treatment be instituted.

ABSORPTIVE AND STIMULATING EFFECTS.

The important group of inflammatory dermatoses offers wide opportunities for the clinical use of the ultra-violet light. The rationale of its use in these cases is based on the combined play of its biochemic properties, of the antipruritic, the bactericidal and biochemical stimulating actions. The most important representative clinical types of this group are eczema, psoriasis, lichen planus and lupus erythematosus.

ECZEMA.

The name "eczema" notoriously covers a multitude of diagnostic sins. Assuming that the diagnosis is correct, there is a great difference in the efficiency of the ultra-violet light in various types of eczema. In very acute types of eczema associated with profuse exudation and particularly with edema, I prefer to avoid radiation altogether and depend entirely on local protective soothing and astringent applications. It is in the subacute stage that ultra-violet light best demonstrates its efficiency. Both in vesicular and papular subacute eczema mild ultra-violet light radiations, two or three times a week, supplemented by non-irritating ointments often bring about striking improvement.

The greater efficiency of the ultra-violet light radiations in subacute than in chronic eczema is partly due to the fact that many of these eczemas are kept up by a secondary streptococcic and staphylococcic infection. In other words, the bactericidal action of the ultra-violet light seems to be more conspicuous than the absorptive. Many of the infantile eczemas are just of this impetiginous type. This is the reason why very mild ultra-violet light radiations are very effective in infantile eczemas. Systemic and dietetic measures are, of course, not to be neglected in any case of eczema. As the case of eczema enters a chronic stage the effectiveness of the ultra-violet light radiations decreases. The dry, infiltrated, scaly and lichenoid types of eczema are particularly resistant. In this type of cases the absorptive action of the X-ray is infinitely superior to the ultra-violet ray and should be the method of choice.

PSORIASIS.

Psoriasis, that bugbear of dermatologists, presents great variations of sensitiveness to the ultra-violet light, depending on the type of the case. The acute, generalized, superficial cases of psoriasis with disseminated miliary or small papular lesions are likely to respond the best.

LICHEN PLANUS.

In lichen planus, particularly in generalized cases, I find ultra-violet light extremely useful, because of its antipruritic effect, and still more because of its beneficial systemic effect. Lichen planus is admittedly a skin manifestation of nervous or general debility or toxemia, and the general vitalizing action of ultra-violet light radiations is of direct curative value. I give mild general radiations two or three times a week supplemented by the appropriate local and general measures.

LUPUS ERYTHEMATOSUS.

One of the most striking illustrations of the efficiency of ultra-violet light is presented by the chronic discoid type of that interesting dermatosis, lupus erythematosus. The lesions of this type are notorious for their persistence and resistance to ordinary medication. The pressure treatment with the lens of a water-cooled burner has in these cases given me truly marvelous results. The dosage in these cases can be heavy, a full erythema dose or blistering once every two or three weeks. One should remember, however, that lupus erythematosus is merely a manifestation of a focal infection and that systemic attention to the etiologic factor is imperative.

ULTRA-VIOLET LIGHT AS SYNERGIST AND ANTAGONIST TO THE X-RAY.

One of the most interesting qualities of ultra-violet light is its peculiar biochemical and clinical relationship to the X-ray. The close position in the spectrum of the waves of ultra-violet light and X-ray makes the fact easily understood that the ultra-violet light possesses some actinic value, though in a degree inferior to X-ray to that extent it can be substituted for the X-ray in some superficial cases. Because of its perfect safety the ultra-violet light should be the method of choice in all superficial dermatoses requiring only a relatively small amount of actinic energy. Ultra-violet light has an additional biochemical advantage over X-ray of possessing a marked bactericidal power which X-ray does not have. An important technical advantage of the ultra-violet light over X-ray is its capacity to radiate large areas of the body, which increases tremendously the field of its clinical usefulness. Two factors of a more subtle relationship between the ultra-violet light and X-ray have been brought out recently by Sampson. The first is, that the ultra-violet light sensitizes the skin to X-ray. This is a factor of tremendous therapeutic importance. The second is, that the ultra-violet light, apparently due to its remarkable property of biochemical stimulation and vitalization of the tissues, is capable of counteracting to an extent the injurious effects of the X-ray on the skin. In fact, at present the ultra-violet light radiation is accepted as the best available biochemical method of treating X-ray burns.

This remarkable combination of synergistic and antagonistic relationship between ultra-violet light and X-ray can be utilized to a great advantage in a combined use of these two agencies in the treatment of various dermatoses. It has been my practice for several years to alternate or intersperse a few fractional doses of X-ray between ultra-violet light radiations. This allows us to obtain the sought for clinical effects with a smaller amount of X-ray. I wish to caution, however, that this combined treatment calls for a very careful measuring of X-ray dosage and careful gauging of clinical skin phenomena.

CONCLUSION.

The above remarks present the clinical conclusions of an experience with ultra-violet light therapy in a large number of dermatological cases. Ultra-violet light has proven its value in such a large variety of dermatologic cases that the place of honor in the dermatologic armamentarium can be conceded to it beyond any possibility of a doubt or dispute. The X-ray and radium are the most powerful weapons at our command, and in certain types of cases they admit no rivals or substitutes. For this very reason their use must be restricted to a rather limited and carefully selected field. On the other hand, the ultra-violet light happily possessing actinic value and safety can be used in a much larger clinical field. In my practice I use various modalities of the ultra-

violet light more than any other therapeutic agency.

(*Extracted from The Urologic and Cutaneous Review. Vol. 30, No. 6, June,* 1926.)

INTESTINAL TUBERCULOSIS.

Charles E. Atkinson, M.D., California.

LIGHT THERAPY.

This is the agency that has revolutionized our ideas as to the prognosis in intestinal tuberculosis. Natural sunlight and artificial rays of various kinds have been used for this purpose but, in the main, dependence has been placed upon either sunlight or rays from the mercury quartz burner (Alpine sun lamp.) Where the sun shines regularly, particularly at seasons where the heat is not too great, sunlight may be advantageously used. Rollier, of Leysin, has used sunlight almost exclusively. On the other hand, Erickson, using the quartz lamp at Saranac, reports beneficial results of greater or lesser degree in eighty-five percent of a series of eighty-one cases.

In giving quartz lamp radiations it is ordinarily not necessary to confine the initial exposure to the lower limbs, but the same rule is followed as when giving the sun bath for determining whether or not the chest is to be exposed. The early exposures are made at a distance of thirty inches. At first the front and back of the body are exposed for from one to two minutes each, and increments of from one to three minutes are subsequently made, until a maximum of forty minutes, equally divided between the front and back, is reached. Thenceforward in suitable cases, the lamp is lowered an inch or two at a time, till the burner is twenty inches from the body. The lamp baths are usually given thrice weekly, although, in a few cases, they have been given daily.

Mrs. M. V. J., age 35, admitted to sanatorium April 15, 1923. History of dry pleurisy six years previously; easily fatigued; slight loss of weight; cough for four months; blood-spitting recently. Temperature 101 degrees F. Appetite fair; no abdominal symptoms or signs. Bilateral, fibro-ulcerative tuberculosis, relatively quiescent in right upper and middle lobes; active lesion of less extent on left.

During next few months fever subsided and on the whole a fairly satisfactory response was noted. At this time appetite and digestion began to fail, and patient complained of general uneasiness in the abdomen, with vague pains. Bowels, which had formerly moved regularly, now became constipated. Constipation became increasingly refractory. Temperature again became elevated. Several weeks later, mild diarrhea occurred without warning. Constipation again developed. During the following months a number of attacks of diarrhea, of greater severity, occurred. Diarrheal movements occurred with increasing frequency, and these, with pain, became a daily feature. Weight loss thirty pounds since abdominal symptoms began.

Barium enema now revealed spastic condition of ascending and transverse colon; total absence of barium shadow in cecal region. Second enema a week later showed same findings.

Quartz lamp radiations, excluding chest, instituted at once and continued thrice weekly with progressive increases. Injections of calcium chloride given every five days. Alberty food given, but did not agree. Placed on condensed milk and rice water mixture, which was fairly well tolerated, but patient took inadequate quantity and continued to lose weight, stools becoming slightly less frequent and consistency showing some improvement. Loss of weight continued during first part of second month and caused uneasiness. After about eight weeks, cream of wheat, milk toast, scraped raw meat sandwich, added to menus.

Symptoms continued to abate, permitting gradual extension of dietary to semi-normal menus by beginning of fourth month. Patient now slowly regaining weight. Lamp treatments continued for a total of seven months. Patient moved to private house in September, 1924, but continued to follow instructions carefully.

May, 1926, patient has had no return of bowel symptoms and has been doing housework for more than a year.

A. K. F., male, age 32, first seen in February, 1924. Pulmonary tuberculosis of eleven years' standing; history of partial arrest on several occasions, followed by renewed outbreaks. Last breakdown of eight months' duration. Expectatoration four ounces daily, temperature 100.5 degrees. Dyspeptic symptoms and abdominal pains for last six months. Tendency to mushy and frequent evacuations first noted about eight weeks ago; looseness becoming more pronounced. Weight loss twenty-five pounds in six months. Had been confined to bed and on restricted diet for five months without result. Active, bilateral tuberculosis of lungs. Abdomen thin; decided tenderness and muscular spasm over central and lower zones. X-ray study showed hypermotility in jejunum and ileum, filling defect in cecum.

Diet of condensed milk and rice water instituted, adding other articles after third week. Calcium chloride intravenously. Parathyroid. Quartz radiations, excluding chest, given systematically. Improvement in consistency of stools noted shortly; within two months stools reduced to two or three daily, with lessened pain and general improvement. Front and back of body were now each receiving twenty minutes' exposure, with burner at thirty inches. Several attempts were made to bring the light nearer the body inch by inch, but each time an acute attack of pain came on, sometimes accompanied by nausea. On inspecting the abdomen during these attacks, rather violent peristaltic waves were evident to the eye. When lamp was again raised to thirty inches, the distressing attacks ceased.

With continued treatment, stools gradually assumed normal character, temperature subsided, and in October, 1924, lung condition had become quiescent. A short time later patient went home, and has not come under observation again, but at this date (May, 1926,) he is reported to be doing well.

(*Extract from Clinical Medicine, Vol.* 33, *No. 6, June,* 1926.)

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CLINICAL CONGRESS OF PHYSICAL THERAPY IN CONJUNCTION WITH THE FIFTH ANNUAL MEETING OF THE AMERICAN COLLEGE OF PHYSICAL THERAPY.

Drake Hotel, Chicago, Ill.
October 18 to 23, 1926.

Preliminary List of Speakers.

Biophysics of Ultraviolet Light — Albert Bachem, Ph.D., University of Illinois, College of Medicine.

Industrial Physical Therapy — John Stanley Coulter, M.D., Chicago.

Physical Therapy — Franz Nageltschmidt, Dr. Med. Berlin, Germany.

Light Therapy—Prof. Leonard Hill, London, England.

Physical Agents in Gynecology — A. David Willmoth, M. D., Louisville.

Physical Therapy in Dermatology — Lynne B. Greene, M.D., Kansas City.

Practical Application of Physical Agents—Jos. E. G. Waddington, M.D., Detroit.

Eye, Ear, Nose and Throat Diseases—M. H. Cottle, M.D., Chicago.

The Rational Teaching of Physical Therapy—(a) Medical Students. (b) Technicians. Harry Leslie Langnecker, M.D., Stanford University, Palo Alto, California. Discussion opened by Prof. H. A. McGuigan, Harry E. Mock, M.D., Northwestern University of Illinois, College of Medicine, Medical School, Chicago.

Artificial Light in Tuberculosis — (Illustrated) — Edgar Mayer, M.D., Saranac Lake. Discussion opened by Ellis B. Frelich, M.D., attending physician (T. B.) Cook County Hospital, Chicago.

Ultraviolet Radiation in Leg Ulcers—Arthur E. Schiller, M.D., Detroit. Discussion opened by Lynne B. Greene, Kansas City.

Address — Experiments Dealing with the Effect of Ultraviolet Radiation—Prof. H. Steenbock, University of Wisconsin, Madison. Discussion to be opened by Prof. Arno B. Luckhardt, University of Chicago, Prof. A. C. Ivy, Northwestern University Medical School.

Use of Physical Energies in the Management of Tuberculosis Peritonitis—A. David Willmoth, M.D., Louisville. Discussion opened by Gustavus Blech, M.D., Chicago.

Actinotherapy in Infections—Wm. E. Howell, M.D., Chicago.

History of Ultraviolet Ray Therapy—M. B. Cirlin, M.D., Chicago.

Electrothermic Methods in Surgery—Wm. L. Clark, M.D., Philadelphia. Discussion opened by Gustav Kolischer, M.D., and Frank J. Novak, Jr., M.D., Chicago.

Combined Physiotherapy in the Treatment of Obesity—Franz Nagelschmidt, Dr. Med., Berlin, Germany.

Newer Aspects of the Problem of Partial Deafness with Special Reference to Physical Methods of Treatment—A. R. Hollender, M.D., and M. H. Cottle, M.D., Chicago. Discussion opened by Ellis G. Linn, M.D., Des Moines.

Physical Agents in the Treatment of Injuries—Harry E. Mock, M.D., Northwestern U. Medical School. Discussion opened by Frank H. Walke, M. D., Shreveport, and John Stanley Coulter, M.D., Chicago.

Arthritis—W. Scott Keyting, M.D., Salt Lake City.

Treatment of Pulmonary Tuberculosis—W. B. Chapman, M.D., Carthage, Mo. Discussion opened by James A. Britton, M.D., Chicago.

The Status of Physical Therapy in Connection with Orthopedic Surgery—Philip H. Kreuscher, M.D. Discussion opened by Philip Lewin, M.D., Chicago, Paul Magnuson, M. D.

THE QUARTZ LAMP

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British Hanovia Quartz Lamp Co., Ltd., Slough, Bucks, England.
Nippon Hanovia Sekiei-to Kabrishiki, Kaishe, Tokyofu, Japan.
Quarzlampen Gesellschaft, m. b. H., Hanau, a. M., Germany.

VOL 4 No. VIII. AUGUST, 1926 ISSUED MONTHLY

CONTENTS OF ISSUE.

OBSERVATIONS ON THE THERAPEUTIC ACTION OF ULTRAVIOLET LIGHT UPON THE EYE.

W. Stewart Duke-Elder, M.A., M.D., F.R.C.S.
(From the National Institute for Medical Research and the Ultraviolet Clinic, Royal London Ophathalmic Hospital.)

Of late years, owing largely to the work of Leonard Hill and his co-workers, the treatment of general disease by ultra-violet light is being rapidly put on a scientific basis, but hitherto no serious attempt has been made in this country to investigate how far it might be utilized in the treatment of diseases of the eye. To this paper, which is a preliminary report of the experience gained at the Ultraviolet Clinic of the Royal London Ophthalmic Hospital, I must prefix an acknowledgement of my indebtedness to the Medical Research Council for opportunity and financial aid in this work, and to Professor Leonard Hill and Sir John H. Parsons for much stimulating help and encouragement. The preliminary nature of the paper must be emphasized. The method of treatment cannot as yet be said to be altogether out of the experimental stage, and sufficient experience has not yet been obtained to dogmatize absolutely on its indications and limitations, or to assign to it its ultimate value in our therapeutic armamentarium. The present paper is based on the treatment of seventy cases, and it is hoped that later, when larger statistics have been gathered, fuller and more authoritative reports will be published. At the present moment, however, it is felt that results of sufficient interest have accumulated to warrant publication, largely in the hope that the knowledge of them may stimulate others to supplement them out of their own experience.

At present the therapeutic action of ultraviolet light is largely a mystery which presents theoretically many interesting and elusive problems. The clinic has outrun the laboratory, for the stimulating effect of this form of radiant energy upon the normal individual, and its therapeutic influence in many diseased states, cannot be denied. It is already well known that ultraviolet light, particularly of wavelengths 2,500 to 3,000 Angstrom units, exerts a very definite biological action on the skin, whose apparent signs are the production of an erythema followed by death and desquamation of the outermost layers, and that thereby activities of great therapeutic value are called into being. These activities are comprised partly of electrical forces set free in the change of potential involved in atomic disintegration, and partly of chemical factors, the

result of the destruction or partial destruction of the cell proteins, the products of whose death and disruption, being set free into the general circulation, increase the non-specific immunity of the body, much in the same manner as the production of homoproteins presumably plays the leading part in the chemical mechanism of defence and immunization against disease generally. In the benefits of these activities the eye shares in common with the rest of the body.

In the treatment of eye diseases ultraviolet light may be utilized in two ways: applied as general light baths to the skin of the body generally, or applied locally to the eye itself. We shall refer to the first as "general phototherapy," to the second as "local phototherapy."

GENERAL PHOTOTHERAPY.

The technique employed by the writer in the administration of general light baths is based on that elaborated by Leonard Hill and Eidinow at the National Institute for Medical Research. This method of procedure aims at giving the optimum intensity of radiation over the optimum area of body surface as gauged by the estimation of the bactericidal power of the blood. So far as we are aware at present, this is the only systemic effect of radiation which submits itself to scientific estimation on whose basis we can regulate our treatment. Hill, Eidinow, and Colebrook have shown that after exposure to ultraviolet light this property of the blood is increased, sometimes to a marked degree, the effect being due in large measure to the formation and biological action of photochemical products liberated from the leucocytes. Further, Colebrook has demonstrated that excessive dosages diminishes the haemo-bactericidal power, an effect which can be correlated with the mental and physical depression which too large doses of ultraviolet light almost invariably produce. The total effect produced varies with the intensity of the radiation and the area of skin exposed and, going a step further, Eidinow has shown that the optimum effect is obtained with radiation of such intensity as produces a mild erythema extending over an area of about one-quarter of the body surface.

Individuals vary largely in the degree of their susceptibility to light, and therefore the routine procedure adopted is to estimate first the reaction of the patient by a determination of the duration of exposure required to produce the faintest recognizable erythema. This "minimal erythema dose" is obtained by exposing small areas of the inner surface of the arms or of the back to the mercury vapor lamp at about one metre distance for periods of two, three, and eight minutes. The following day the areas are observed, and dosage commenced whose duration is judged from the standard thus obtained. Thereafter, during the course of the treatment, the body is divided into four areas—the chest and front of the abdomen, the back, the front of the legs, and the back of the legs—and each of these is irradiated on alternate sittings. The patient attends the clinic on three days a week, and in this way practically the whole body is irradiated once in ten days. The object of each dose is to produce the faintest perceptible erythema, after which there is a fine desquamation of the cuticle. This desquamating skin is very opaque to the ultraviolet rays, and to irradiate it would be largely a waste of time; further, the newly exposed skin is extremely sensitive, and gives a strong reaction. The ten days' interval between successive treatments of the same part brings the alternating areas up for re-exposure after the stage of desquamation has passed, and when fresh but not too sensitive skin is exposed. By this routine an optimum reaction is obtained automatically over an optimum area; an optimum increase of the haemo-bactericidal power is induced; and with this—as far as we can judge—an optimum general effect is obtained from the course of treatment.

Sensitiveness varies largely with individuals, and moreover with different parts of the body in the same individual; the back and hams are practically always more easily affected than the front of the body. The dose is therefore regulated for the individual, and varied with the area exposed to suit the case. After some time a certain amount of immunity develops. As a general rule the initial dose is two to three minutes with the mercury vapor lamp and works up fairly rapidly to twelve or fifteen minutes, where it remains for a very long time, since the small dose given and the method of alternately resting the skin keeps it in a condition of "light sensitiveness."

CLINICAL CONDITIONS.

As in the other parts of the body, so in the eye, the diseases most amenable to treatment are the chronic inflammatory. This, in fact, is one of the most satisfactory aspects of phototherapy in ophthalmology, for in many of these cases little can be done by the ordinary methods of treatment at our disposal. The experience gained points to the view that in the earlier acute stages general phototherapy very frequently does more harm than good, and that relapses are prone to occur. The best time to commence treatment appears to be immediately after the acute symptoms have passed off, before the disease can be definitely labelled "chronic," and before the lesion is complicated by the accumulation of massive organized deposits, or restoration rendered impossible by extensive tissue degeneration and destruction.

In the eye cure, from the patient's point of view, is placed on a much higher standard than elsewhere in the body. By him the end-result is interpreted in terms of the vision finally obtained, and whereas elsewhere the formation of a cicatrix is welcomed as a desirable termination deserving to be considered a satisfactory cure, in the eye such a culmination too often renders the organ useless, and is therefore interpreted as a failure. For this reason it is important to get the cases under carefully supervised treatment as early as is safe. In many chronic cases improvement has been slow, and, although in some the rate of progress has been astonishing, in others the treatment has been a question of weeks or months, calling for no little patience on the part of all concerned. Experience has shown that this should never be allowed to tempt one to increase the dosage beyond the limits already outlined. With the ease with which it lends itself to examination, and the importance the patient places upon slight changes in subjective symptoms, the eye lends itself to the appreciation of slight changes for better or for worse more readily than most organs of the body; and I am convinced that the best results are obtained by rigidly refraining from "pushing" the treatment, but rather allowing what is really a natural cure of the disease to act slowly, and gradually, and naturally.

In all cases, almost from the commencement, the marked general tonic effect is evident. Almost invariably, whether the eye condition clears up or not, one is told that the patient feels better and stronger and is generally more fit, that the appetite increases, sleep improves, and weight is put on. Particularly is this seen in children, and more especially in the sun-starved creatures that the hospital largely caters for. Not only is the stimulation confined to the physical state, but usually the mental state responds as well—indeed, in the assessment of the progress of treatment this factor leads one easily astray: the influence of the undoubted psychical effect of the treatment at the clinic, the unfortunate popular belief that ultraviolet light is a cure-all for everything, and the general mental and physical tuning up, delude the patient into thinking that rapid progress is being made, and it is

easy for the observer to be led to share in his enthusiasm.

(*Extracted from The British Medical Journal, May 29, 1926, No. 3412—continued in subsequent issues.*)

SOME APPLICATIONS OF THE ULTRA-VIOLET RAY IN EYE, EAR, NOSE AND THROAT WORK.

H. F. MacBeth, M.D., Seattle, Washington.

For the benefit of those who may not be familiar with the ultraviolet ray, I will spend a moment in giving the source and general consideration of these rays.

The most efficient generator of the ultraviolet rays is commonly conceded to be the Quartz Enclosed Mercury Vapor Arc. Lamps of this character produce a spectrum extremely rich in ultraviolet rays.

Measured in Angstrom units the rays we are considering range from 1849 A° to 3900 A°; above this being the blue, green, yellow, orange and red bands of the spectrum; which bands are, of course, visible and which in turn end at 7700 A° to give place to the infrared or heat waves, and so to wireless wave lengths.

Below the shortest ultraviolet ray we find the x-rays and emanations of radium.

In order to avoid confusion, let me state here that the ultraviolet ray is just as definite a physical and therapeutic agent as the x-ray; differing from x-ray in wave length and having individual properties quite as clean cut.

The ultraviolet ray is not produced by so-called violet ray outfits, and is entirely a different modality from diathermia, high frequency, radiant heat lamps and colored lights of all descriptions.

As ordinary glass absorbs practically all ultraviolet ray, any appliance using glass must be considered valueless from a therapeutic standpoint. Ultraviolet rays are transmitted freely by air, water, rock-crystal or quartz. Instruments for the application of these rays must, therefore, make use of one of these three agents. Heat plays no part in the application of these rays; their effect being due wholly to chemical reaction.

The clinically proven therapeutic properties of the ultraviolet rays may be classified as bactericidal, analgesic, and biologic.

To enlarge upon the bactericcidal action of the ultraviolet ray let me quote Dr. W. T. Bovie, Harvard University, and Dr. Sidney Russ, Middlesex Hospital, London, England, as authorities for the statement that no known form of bacteria can live in this ultraviolet light more than five minutes.

Dr. S. Bayne Jones and Dr. J. S. Vander Lingen of Johns Hopkins Hospital have proven that spores are killed within seven minutes. To appreciate this power it may well be remembered that radium requires five hours in which to kill bacteria. Dr. H. Wago, Tokio, Japan, gives the following times in seconds to kill all bacteria in solutions at a distance of ten inches from the source of ultraviolet light, for example:

Staphylococcus	5 to 10 seconds
B. typhosis	10 to 20 seconds
B. coli communis	15 to 20 seconds
B. anthracis	20 to 30 seconds
B. subtilis	20 to 60 seconds
Vibrio cholerae	10 to 15 seconds
B. Dysenteriae	10 to 20 seconds
Diplococcus pneumoniae	20 to 30 seconds
B. tetani	20 to 60 seconds

Ultraviolet light not only kills bacteria, but breaks down the toxins resulting from their presence.

Dr. Edgar Mayer, of Saranac Lake, writes that the analgesic effect is often seen especially in intestinal cases; also in painful Arthritis, Myocitis and Neuritis.

It is a common occurrence in my practice to relieve the acute so-called facial neuralgias with but one application of the rays from an Alpine ultraviolet lamp.

Chronic cases may be alleviated even before the focal infection is discovered and cared for.

The pain attendant upon acute Sinusitis may be materially diminished within a short space of time; patients voluntarily remarking upon the relief before leaving the office.

The following case seems worthy of mention in this connection:

Mrs. R. E. came to me on October 29, 1924, complaining of excruciating pain extending from the temporal region down the ramus of the jaw and forward along the mandible to the median line. The pain, which had persisted for more than twelve months, had disturbed her rest and appetite. She had lost weight, and had become a decided neurotic. She had subjected herself to a mandibular resection from which she had obtained no relief whatever. A diagnosis of sinus infection was made, which was confirmed by x-ray findings. I commenced ultraviolet treatment from an Alpine lamp without any attempt to relieve the sinus condition and in one week of daily treatment the patient was entirely free from pain.

The biologic effect of the ultraviolet ray upon the human organism is most profound and is accomplished by the direct effect exerted by these rays upon the blood.

Metabolism is increased by exposure to the ultraviolet ray. It also increases the alkalinity of the blood and raises the phosphorus and calcium content.

This strong tendency to normalize disturbed metabolism is perhaps most clearly demonstrated in the treatment of rickets. The work accomplished at Johns Hopkins, Yale, Harvard, Columbia, Rush Medical College, and other institutions, has led to the universal adoption of ultraviolet ray in the treatment of this type of disease.

Margaret B., age 7 years, contracted pneumonia at 10 months of age. The child had always been delicate, and upon the slightest exposure developed Rhinitis and Bronchitis. In fact, her parents had quite despaired of rearing her. She was under the constant care of a physician, and changes of climate, vaccines, and conscientious routine treatment were resorted to without avail. During this time the child developed a chronic sinusitis with a most profuse nasal discharge, her general condition growing slowly worse. Local and general ultraviolet treatment was instituted November 8th, 1924. During the winter she was given 35 irradiations, and contracted but two so-called colds, both of which cleared up within two days.

In February of this year, without having had recourse to surgery she was dismissed weighing three pounds more than her twin sister, a normal child, for the first time in her life.

The usefulness of ultraviolet light in disease of the eye is confined principally to the lids. Dr. G. C. Wagner is responsible for the statement that in ultraviolet we have one of the most efficient remedies yet brought forth for the treatment of Trachoma. Its penetrating germicidal action without the formation of scar tissue, and its property of reducing hyperplasia are the outstanding qualities which make for its efficiency.

In Vernal Catarrh, ultraviolet light relieves the intense itching with the first few applications. Photophobia also disappears. The structure of the conjunctiva seems to change but little, which may be due to the fact that the patient, being comfortable, does not return for sufficient treatment.

Mr. J. B., who for many years had suffered from aggravated Spring Catarrh, began treatment at the first signs of irritation in the summer of 1924, and after receiving but twelve treatments was benefitted to such an extent that he spent the rest of the summer without discomfort. To me it seems quite remarkable that this year he reports no return of symptoms.

Chronic Follicular Conjunctitis responds very kindly to ultraviolet light treatments. It has also a markedly cura-

tive influence in cases of recurrent Hordeoli.

To my knowledge ultraviolet light has no effect whatever upon Chalazion. The same may be said of acute and chronic Dacryo cystitis.

The usefulness of ultraviolet light in diseases of the globe is limited to infections of the cornea and sclera. It is a most valuable agent in all forms of corneal ulcer. Its most powerful germicidal ray may be brought in direct contact with the infected tissue by means of the quartz rod. In efficiency it may be likened to the actual cautery, but without its destruction to tissue and resultant scar formation.

There is perhaps less chance for the use of ultraviolet light in diseases of the ear than any other field, and while theoretically it should be a most excellent remedy in suppurative diseases of the middle ear, I have had but moderate success in handling these cases.

Mastoiditis, on the other hand, has responded most favorably in cases where one would hardly expect to obtain a result.

While of minor importance, fungus infections of the external auditory canal are often most annoying, because of their obstinacy. They are quite prone to resist the well-known forms of treatment and one despairs of seeking some new remedy that could reasonably be expected to bring about the desired change. While ultraviolet light does not always relieve the patient as quickly as he may wish, nevertheless, the improvement is continuous.

Marion J. was referred to me in 1921 with a diagnosis of double mastoiditis. This proved to be nothing more or less than an aggravated case of Aspergillus infection. She was treated month in and month out, and was seen by a prominent Chicago aurist on a visit here. His suggestions were followed without any apparent change until November, 1924, when the patient was put upon ultraviolet light treatment, to be dismissed some four months later as cured.

In infections of the sinuses, ultraviolet light comes as an especial boon. Operative interference is reduced to a minimum and in children may in the majority of cases be dispensed with altogether. After establishing reasonable ventilation and drainage local and general irradiations are instituted, and in much less time than was customary following radical work these patients show marked improvement.

Dr. E. P. F. has for years suffered from a chronic frontal sinusitis. The anterior tips of the middle turbinates had been amputated, but there remained quite a marked deflection of the septum, which the doctor refused to have corrected on the grounds that he had received so little benefit from the turbinate work. He was quite frank in stating that anything operated by electricity, except his x-ray outfit, was in his opinion of very questionable value. Under ultraviolet treatment he continued to improve for several weeks, but declined to give the method any credit on the grounds that he had had such periods of improvement before. In February, 1925, he developed an acute attack of frontal sinusitis, and insisted upon changing the treatment, or at least supplementing it with cocaine and adrenalin, stating that at best he would be confined to the house for three or four days, and in much distress for another three or four. He omitted the adrenalin and cocaine as I considered it an unusual opportunity to test the efficiency of ultraviolet light. The irradiations were given externally and intra-nasally after 6 o'clock in the evening, and the following morning the doctor reported that he was quite relieved, and was making his usual calls.

A case in which I followed my usual line of procedure was that of B. S. M. In 1906, he consulted a rhinologist, because of his headaches and nasal obstruction. An operation was done at that time, the character of which I was unable to ascertain. In 1914, Dr. Edward Smith, of St. Paul, removed some nasal palypi. In 1920, Dr. W. H. Hopkins, of Spokane, again removed nasal polypi, did a submucous resection of the septum, and advised a sinus operation. The operation, however, was not done, and the patient continued to have trouble until he was confined to bed in April, 1925. On the 10th of that month, instead of doing the radical work usually indicated in aggravated cases of such long standing, I did simply an amputation of the tips of the middle turbinates, dilated the naso-frontal ducts and made a good sized opening into the antrum through the middle fossa. He was immediately given local and general irradiations, and in two weeks' time, against my advice, had resumed his duties, which are of a very exacting nature. At the present writing, two months later, the patient has been dismissed, being completely relieved of pain, free from his former copious discharge, and he claims to feel better than he has ever felt before.

Abscesses of the ala nasi are of particular importance for the reason that surgical interference tends to increase the incidence of cavernous sinus thrombosis. These abscesses are especially amenable to ultraviolet light.

Incipient cases may always be aborted and the advanced cases materially influenced toward a favorable termination.

To illustrate, Miss Elizabeth J., trained nurse, started treatment on the fourth day after the appearance of an abscess, which was already showing initial signs of breaking down. One treatment was given which lessened the pain and after the sixth treatment there was no evidence of any pathology.

It must be admitted that ultraviolet light therapy has an unusually wide field, but it must also be borne in mind that it has limitations, and is in no sense of the word a cure-all. As before stated, I have failed to secure entirely gratifying results in suppurative conditions of the middle ear, and while there is much in the literature laudatory as regards the application of the ray in tonsillar conditions, I have personally been unable to confirm this. Authorities agree that the spirochaeta pallida is not perceptibly influenced in the blood stream. The majority of the writers contend that the use of ultraviolet is strongly contraindicated in diabetes insipidus and mellitus. In fact, cases have been reported in which irradiation of diabetics has produced symptoms approximating severe surgical shock.

The results obtained by the use of ultraviolet light are largely a matter of technique, and it is so entirely different from anything which has ever been a part of our armamentarium that one is at first almost certain of disappointment.

Three months after I installed my equipment I felt its field of usefulness was so limited that it was not worth while. To-day I would be seriously handicapped without my ultraviolet lamps. Most of the accessories furnished by the manufacturers I have discarded and in their place have substituted devices which permitted using principles which have proven of value in other branches of medicine.

Dermatology must be given the credit for first making use of the ultraviolet ray, and the principles applied by the immortal Finsen are the same now as in his day. We are perhaps the last to make use of what has so long been known. Our problem is one of being able to adapt this knowledge to our work.

Time does not permit of discussing technique. I do wish to say, however, that once mastered, it is a constant source of satisfaction to make use of this most efficacious agent, and that it is a most interesting vehicle with which to penetrate the untried fields of our selected branch of medicine.

(*Abstracted from The Eye, Ear, Nose and Throat Monthly, June,* 1926, *Vol.* 5, *No.* 5.)

men on admission, he had no kidney complications. He was discharged on the sixteenth day, although he should have stayed in the hospital longer, but was anxious to get out on his insurance debit. This burn, while not involving as much surface as some, was about the worst I have seen. I had known the man for several years, but did not recognize him when I was called to his room. His hair was burnt off, his ears, lips, nose and eyes were in a terrible condition. We thought for a while he would lose his lower lip and nose and possibly the ears, but they healed up nicely without a scar. The wrists were so badly burned we expected contractures, but they are perfectly normal, and the only scarring is a small keloid of the right little finger, due to the fact that when he left the hospital he had large scabs on his right hand and, although he was ordered to return for treatments until the hands were well, he did not do so, but removed the scabs himself before they were ready to come off. He is more than pleased with the results, and is one of our biggest boosters.

Case Three: Robert C., age 4, white.

Present Illness: Was playing in bonfire when coveralls caught fire, burning both legs to the trunk.

Physical Examination: Second and third degree burns, complicated with whooping cough.

Treatment: Undressed and put to bed at home with 300 watt lamp and improvised reflector made at tin shop, suspended over the burned area. No dressings. His gown was pinned up around the waist, so as to expose the burned parts to the air and light. Light kept on constantly day and night; blisters were not opened, but allowed to absorb and the scabs allowed to drop off of their own accord. This little patient moved about in bed to allow the light to get to the posterior portion of the legs and thighs. He had no pain or loss of sleep, no complications, but was up and dressed on the twelfth day and riding tricycle about the house, which had a great deal to do with keeping down contractions at the knee joint. He knocked the scabs off by the pedal of the tricycle, getting some infection therefrom, and was taken to the hospital and given two treatments of ultraviolet light, water cooled. He is healed perfectly, with no scars or contractures. I wish to mention the fact that in these cases no skin grafts were necessary, as the epithelium grew nicely from the edges of the normal skin and covered the whole area.

CONCLUSION.

Light therapy is the treatment *par excellence* in burns for the following reasons:

1. It relieves pain.
2. Keeps down infection.
3. Stimulates epithelial growth.
4. Eliminates scars and contractures.
5. Normalizes the red and white blood count.
6. Accelerates elimination.
7. Normalizes body metabolism.
8. A wonderful tonic.
9. It makes a grateful patient.

(*Extracted from Archives of Physical Therapy, X-Ray and Radium, Vol. VII, No. 6, June,* 1926.)

CLINICAL CONGRESS OF PHYSICAL THERAPY IN CONJUNCTION WITH THE FIFTH ANNUAL MEETING OF THE AMERICAN COLLEGE OF PHYSICAL THERAPY.

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Quarzlampen Gesellschaft, m. b. H., Hanau, a. M., Germany.

VOL 4 No. IX SEPTEMBER 15, 1926 ISSUED MONTHLY

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TREATMENT OF IDIOPATHIC PURPURA HEMORRHAGICA BY EXPOSURE TO MERCURY VAPOR QUARTZ LAMP—PRELIMINARY REPORT.

J. W. Sooy and Theodore S. Moise, M.D.
(From the Department of Surgery, Yale University School of Medicine, and the Surgical Clinic of the New Haven Hospital.)

The treatment advocated for idiopathic purpura hemorrhagica is entirely symptomatic in nature, with chief emphasis placed on checking the hemorrhage and replacing the lost platelets. Heretofore, the most satisfactory method of treatment has been the transfusion of blood, although the beneficial effects are usually transient.

In their study of the effect of light and of darkness on the constituents of the blood, Laurens and Sooy have observed a stimulating influence of direct sunlight and an inhibitory influence of darkness on the number of red blood cells and platelets in white rats. Furthermore, they have observed a more pronounced stimulation of these elements of the blood after exposure of white rats to the mercury vapor quartz lamp. This stimulating influence of light therapy on the blood platelets was quite obvious after three daily exposures of six minutes at a distance of 2 feet.

This knowledge, with the fact that the most characteristic pathologic finding in idiopathic purpura hemorrhagica is a reduction in the blood platelets, suggests a more rational method of treatment. Furthermore, it is suggestive that other hemorrhagic conditions associated with a deficiency in the blood platelets might respond to similar methods. On this basis, we have applied the mercury vapor quartz lamp with benefit in the treatment of idiopathic purpura hemorrhagica, in hemorrhagic disease of the new-born, and in the preoperative preparation of jaundiced patients showing a platelet deficiency and a tendency to bleed.

It is our purpose in this communication to make a preliminary report of the results of the treatment of idiopathic purpura hemorrhagica by exposure to the mercury vapor quartz lamp. During the last year, we have treated ten cases of this disease. One half of these cases have been observed during an acute phase, while the remaining ones have been of the chronic variety. In two instances, the treatment was used as a method for the preoperative preparation

of patients in need of surgical attention; in one instance, for the extraction of several teeth in a woman who had bled profusely for three days after a recent tooth extraction, and in a second patient with a marked hemorrhagic diathesis, on whom a tonsillectomy was indicated. These precedures were followed by a normal convalescence free from bleeding.

A complete report of this group of cases is now being prepared. In this communication, a typical case will be reported briefly in order to give a concrete illustration of the changes in the blood picture and the progress of the disease during treatment by this method.

Method of Treatment

The method of treatment in these cases has been as follows:

On the first day the patient was given two exposures of six minutes each, at a distance of 13 inches, on the entire dorsal and ventral surfaces of the body. The exposures were increased daily by three minutes for five days, after which the exposure may be increased in daily increments of ten minutes. It is rarely necessary to increase the exposure beyond twenty-eight minutes.

This precedure gives a massive exposure and may produce a somewhat painful hyperemia. In such cases, the treatment is omitted on the following day. No serious burns have been observed.

Summary

The experimental work of Laurens and Sooy has demonstrated a definite increase of the blood platelets after irradiation of white rats with the mercury vapor quartz lamp, and offers a rational basis for the application of this method to the treatment of certain hemorrhagic diseases associated with a platelet deficiency. We have treated cases of idiopathic purpura hemorrhagica by exposure to the mercury vapor quartz lamp with definite beneficial results.

The case reported here illustrates the effect of this treatment on the disease. When the patient was first seen, June 4, 1925, the platelet count was 108,000 per cubic millimeter. She was given five daily exposures to the mercury vapor quartz lamp. On the fifth day, the platelet count was 242,000 per cubic millimeter. On account of a severe cold, the patient did not appear for treatment until five days later. At this time, the platelet count had fallen to 152,000, and there was slight epistaxis. Daily treatments were commenced, and after twelve days (June 25) the platelet count had risen to 546,000 per cubic millimeter. The treatments were discontinued about eight months ago, and there has been no further evidences of the disease. The blood platelet count has been maintained at the normal level.

The number of cases that have come under our observation has been small, on account of the relatively short time interval absolute conclusions cannot be drawn. However, the results are favorable in comparison with other methods of treatment. We hope that this report will stimulate further study, so that the value of this application of the mercury vapor quartz lamp may be accurately determined.

Further investigation is in progress, and a detailed report of all cases observed will be made in a later communication.

(*Extracted from Journal A. M. A., July* 10, 1926, *Vol.* 87, *No.* 2.)

ACTINOTHERAPY IN THE TUBERCULOUS INFANT.

P. Gautier and R. Peyrot.

Rev. Franc. de pediat. 1:447-452, 1925.

The report comes from the "Clinique Infantile" of Geneva, Switzerland, in which, during the past two years, they have been able to follow many babies, who, during the first few months of life, present evident signs of tuberculosis, that

is, stationary weight, capricious and poor appetite, variable temperature, pallor and positive cutaneous reactions. The grave prognosis and therapeutic difficulty attending these cases is well recognized, and the effort of the physician must be to prolong the life of the infant until he, himself, older and more resistent, can fight with better chances of success against his tuberculosis. The authors have found that these cases respond particularly well to ultra-violet light, the appetite and weight improving, and the temperature tending to remain normal. The exposures are given daily, starting with one minute, and increasing a minute a day until a duration of thirty to forty-five minutes is reached. Since using this method of treatment, no deaths have occurred among the tuberculous infants, with the exception of those brought in with tuberculous meningitis.

THE THERAPEUTIC ACTION OF ULTRAVIOLET LIGHT UPON THE EYE.

W. Stewart Duke Elder, M.A., M.D., F.R.C.S.
(From the National Institute for Medical Research and the Ultraviolet Clinic, Royal London Ophthalmic Hospital—continuation.)

Of the 70 cases on which this paper is based, 9 were labelled clinically as tuberculosis—that is, they showed lesions which appeared typically to resemble tuberculosis, had a positive von Pirquet reaction, and other sources of infection were excluded. Eight cases of irido-cyclitis have made, or are making, most satisfactory progress; two examples may be cited.

A woman, aged 37, had had recurrent attacks since 1914; the disease was steadily progressive in spite of all methods of treatment—tuberculin, arsenic, etc.; the left eye was excised in 1920 for pain and raised tension. When ultraviolet light treatment was commenced vision of the right eye was reduced to bare perception of light. After ten weeks' treatment (general and local), intermitted with rest periods, the massive keratitis punctata has completely disappeared, the eye is quiet and white, she can see to get about the streets of London unaided, and is rapidly improving.

A woman, aged 23, who had massive keratitis punctata, ciliary injection, and nodules on the iris, has, after thirteen treatments, a perfectly quiet and white eye, with no clinical pathological evidence.

The remaining case of the nine, a woman aged 23, was of tuberculous dacryocystitis. Five years ago she was under the care of Rollier in Switzerland, under whose treatment the disease cleared up. A relapse occurred eight months ago, and in spite of surgical treatment an open discharging wound persisted. After four weeks' treatment the wound has healed, and all signs of activity have disappeared.

Phlyctenular Kerato-Conjunctivitis.

The other disease in which startlingly good results have been obtained is phlyctenular ophthalmia, especially the type which is met with in so chronic and recurrent a form in the debilitated and sun-starved children of large cities. The ready and rapid improvement in these cases is remarkable; after a few days' treatment most of the distressing symptoms have disappeared and the photophobia has gone; after a few weeks' treatment a child whose eyes have been in a chronic state of intermittent irritation for years will clear up, and the general health will improve in a remarkable manner. Relapses, however, have occurred in a few cases, and the end-results have not been sufficiently long observed to allow one to dogmatize on the permanency of the improvement derived from one course of treatment; but the relapses are easily controlled by a repetition of another course of irradiation. The most satisfactory method of dealing with these cases would appear to be the establishment on a large scale of municipally owned centres in the more congested and badly housed areas

of the large cities, where these children could receive at regular intervals throughout the year some of the benefits of the open air and sunshine which they so sadly lack.

Infective Irido-Cyclitis.

Cases of infective irido-cyclitis show on the average a much less dramatic response to ultraviolet light treatment, and a response which varies very much from case to case. Excluding the tuberculous lesions, the series comprises 29 cases, all of which were of considerable severity, and the majority of which were of very long standing before they were referred for treatment at the clinic. Of these, 5 have improved so rapidly as almost to be considered as cured within a few weeks; 12 have shown a slow and steady betterment; in 8, apart from the usual improved general condition, the eye lesion appears to have made little or no progress; and 4 have definitely got worse during treatment. In 3 of these 4 the reason is now obvious—that treatment was undertaken while the disease was too acute. Thus 60 per cent. showed an improvement, of which proportion in 30 per cent. it was extremely satisfactory; 40 per cent. have reacted disappointingly, but the majority of these, it must be admitted, were of very long standing; all were considered as quite intractable to the ordinary methods of treatment, and most were sent only as a last resort. On the average, therefore, the results of treatment, as judged on a statistical basis, are to a high degree unfair. At the present stage sufficient experience has not been accumulated to lay down any definite rules of general value as to the indications or contraindications—if any—on which to base a selection of cases.

Sympathetic Ophthalmitis: Choroiditis.

The one case of sympathetic ophthalmitis which has been treated improved so rapidly that in three weeks the eye looked quiet and the injection and practically all the keratitis punctata had disappeared. Three cases of choroiditis have been treated. One, a case of many years' standing, showed no apparent change; the other two rapid and marked improvement.

It is to be remembered that in all these cases the usual routine treatment with atropine, etc., was persisted in throughout; tuberculin was given to some of the tuberculous cases, arsenic to the sympathetic, and in the infective irites any focus which could be detected was dealt with, and its removal attempted in the usual manner.

LOCAL PHOTOTHERAPY.

The media of the eye share the property of all living matter of being transparent to some wave-lengths of the energy spectrum and opaque to others. Those waves to which the eye is practically transparent pass through the media without exerting more than a correspondingly negligible effect upon them, either pathologically or therapeutically; it is only those waves which are absorbed which can have any action—a generalization which applies here as elsewhere in the physical universe. In the ultra-violet region of the spectrum it may be taken that all waves shorter than 2,950 Angstrom units are completely absorbed by the cornea, and that above this level an ever-increasing percentage is transmitted, until at the region 3,100 to 3,150 A.U. practically all are transmitted to the underlying lens and iris. The lens absorbs all radiation incident upon it below 3,200 A.U., practically all that below 3,500, and continues to absorb an ever-diminishing amount up to a limit which varies with the age and the degree of sclerosis, but which may be taken to average 4,000 A.U.; the retina is reached, therefore, by practically all the incident radiation in this spectral region above 4,000, and by some of the incident radiation down to wave-lengths as short as 3,200. The pigment in the iris absorbs all wave-lengths that fall upon it, and degrades the energy into heat.

That part of the incident energy which is absorbed produces a reaction which may be either thermal or abiotic, depending on the length of wave. By the use of suitable filtering screens it has been determined that in the cornea the upper limit of wave-length for abiotic response is about 3,050 for the intensities of radiation that can be used clinically, but since comparatively great intensities are required to produce any observable reaction with rays above 3,000, the latter figure may be taken for all practical purposes as the liminal wave-length. Radiation with rays above this produces a thermal lesion, resulting in a burn if sufficient intensities be used; waves shorter than this produce, after a definite latent period, the characteristic symptoms of photophthalmia, with a typical abiotic tissue reaction of desquamation of the epithelium and destruction or partial destruction of the underlying cells. Not only is there a critical threshold of wave-length, but also of energy intensity required to produce a response, which I have found to be on the average, for the production of a mild reaction, slightly under 2 I.K. (infusoria killing) units—that is, such an amount as is obtained from a mercury vapor lamp at a distance of half a metre in two and a half minutes, which corresponds to slightly less than the intensity required to produce a minimal erythema on the skin. In doses under this intensity, short-waved radiation, while it produces no irritant action, seems to have some therapeutic, and certainly some analgesic, action; doses of this intensity produce a temporary abiotic reaction; higher intensities involve a marked photophthalmia, and may, in extreme cases, result in the production of an opacity, which, although becoming highly vascularized and to a large extent disappearing in a few weeks, is often to some degree permanent.

(*Extracted from the British Medical Journal, May 29, 1926, No. 3412—continued in subsequent issue.*)

THE TREATMENT OF BURNS BY ACTINOTHERAPY.

E. B. Kessler, M.D.
St. Joseph, Mo.

In presenting this paper, it is not the intention of the writer to claim any originality in this method of treatment, but merely to show the effectiveness of light therapy in burns and its advantages over the old methods. If there ever was a treatment that should have been revised long ago, it is the treatment of burns.

Think of the patients who have been punished by the old method of applying solutions, ointments and dressings, only to have the physician tear off with his dressings day after day all the repair of nature, with the attendant nerve racking pain and discomfort!

The thing that appeals to me most in the treatment of burns by light therapy is that it comes so near to being just as nature would have it to be. Burns of all kinds heal kindly by light therapy, and a few facts are in order to show why this is true. Practically all burns are naturally sterile at the beginning, as the heat that destroys the tissue also sterilizes the tissue.

It is the duty of the physician to keep them sterile,—but how can this be done? The answer is light therapy. It is an established fact that infection of burns occur from pathogenic bacteria introduced from without, from adjacent unburned skin, clothing, dressings, air, etc.; so, to keep the adjacent normal skin and the affected areas sterile, we use the ultraviolet light, which is the best germicide we have, and it is also the easiest to apply, as it is applied without pain, and without hand, instrument or dressing

coming in contact with the affected sensitive areas.

How simple to allow the rays to shine upon the sensitive tissues and bathe them in the soothing germicidal light, as compared to the old method of antiseptic dressings. Ultraviolet light sterilizes our burn again as it was in the beginning, but in a kinder way.

Let us consider the pathology in burns as given by Delafield and Prudden: "There is apt to be congestion of the brain and the thoracic and abdominal viscera. The lymph-nodes and the lymphatic tissues throughout the body may be swollen and the seat of endothelial cell proliferation and necrosis. There is usually albuminous degeneration of the liver and kidneys; the spleen is swollen, and the seat of focal necrosis. Focal necrosis in the bone marrow has been noted. There may be capillary thromboses, interstitial hemorrhages in the kidney, and leucocytosis. These lesions indicate the presence of toxic substances in the body fluids, and thus the general condition may be regarded as an instance of autointoxication. Secondary lesions are not infrequent; there may be ulceration of the duodenum and pyaemia."

What a field for light therapy! We apply light from the so-called deep therapy lamp, or the electric bath cabinet for its effect in relieving congestion of the deep organs, such as the liver, kidneys, spleen, etc., and to relieve blood and lymph stasis, and to increase elimination of toxins by increased functional activity of the normal skin, and to bring blood to the surface where it can absorb the actinic rays, while the mild heat dries the surface of the moist areas and prevents moist slough.

What could be more efficient than ultraviolet light, which has the effect of penetrating the blood stream, invigorating the red corpuscles, which carry to the cellular elements of the body an increased amount of oxygen, and carry away the increased amount of toxins, raising tissue vitality, bodily resistance, and balancing metabolism?

With light therapy there are no dressings to remove, as my cases have all been treated by the open method, and the blood serum is allowed to bathe the injured tissue constantly beneath the formed, sterile scabs which serve as a protection to the sensitive parts from air, clothing, bed clothes, etc. The scabs are allowed to remain until the tissues beneath are healed and the scabs drop off of their own accord, when we find that the tissue beneath presents a normal appearance. And why not, when nature's protection has been allowed to remain, and the newly formed epithelium has not been torn away by repeated dressings, but bathed and soothed by nature's fluids until the patient, like a snake, sheds the old skin when nature has prepared the new skin beneath to take its place?

We give the same treatment daily; that is, radiant light and ultraviolet, to the new born epithelium until it becomes tanned and toughened to withstand exposure to air and garments. In the cases I have had, I have seen hair on the skin to quite some length when the scabs dropped off, especially on the wrist and backs of the hands. It is not unusual to have scabs drop off like potato chips and in large numbers during a treatment, and to find perfect new epithelium beneath. One of the gratifying things about this method of treatment was that the patients suffered no pain, but rested and slept well from the start. The temperature remained normal in all cases except one, which went only to 101 for two days; all had normal kidney functions throughout the duration of treatment, and digestion, appetite and bowels remained normal. There was no scarring nor contractures.

We all know that ultraviolet keeps down scar tissue, and the cosmetic effect in burns is one of our first aims. A physician should not consider that he has done much for a patient who has his burn healed with disfiguring scar tissue and contractures, for they will do that without treatment; still, there are great numbers disfigured for life who have been treated by the old method.

Let us discard the old treatment and take up the new treatment of light therapy for the patient's sake, as well as our own. I have never had more grateful patients than those treated by this method.

I wish to present three case reports.

Case One: Mr. G. M., age 45, white, occupation laundry foreman, admitted to hospital Jan. 19th, 1925 with burns on back and arms.

Family History: Unimportant except father died with erysipelas.

Present Illness: Patient had some soft soap boiling in a large tank when it started to boil over on the floor. He ran to turn off the gas and slipped into the boiling soap, scalding his back from the waist to the neck and the posterior portion of both arms.

Physical Examination: Second degree burns on back and arms, except an area three inches in diameter on left arm about three inches above the elbow and an area two inches in diameter on right scapular region which are third degree burns. Treatment consisted of light penetration daily for one hour or more by electric light bath cabinet, with stool pulled forward and feet outside cabinet on floor, as the heat at a closer distance was too intense for the tender areas. In this way we were able to get the light well around to the sides of the chest at one sitting, and much better than by the deep therapy lamp. This was followed daily by air cooled ultraviolet at 30 inches for three minutes. No dressings were used, and the patient wore only a hospital gown tied in the back; blisters were not opened, but allowed to absorb, and scabs were not pulled off, but allowed to fall off by body movement, or friction against gown in walking about or lying in bed, which he did without pain or discomfort. Dismissed from hospital as well on eighteenth day. This patient had no temperature, no pain, no urinary suppression, no complications whatever during the whole course of treatment, and no scars when dismissed. I might say this case was quite a contrast to another case of burn that was in the hospital at the same time being treated in the old way and patient had to have opiates constantly, and then suffered a great deal of pain and loss of sleep.

Case Two: Mr. J. R. C., referred by Dr. G., age 48, white; occupation, insurance agent; admitted to hospital by ambulance June 20th, 1925.

Present Illness: Struck match in basement of his home to light water heater, when there was an explosion from leaking gas, burning patient badly and wrecking the house.

Physical Examination: First, second and third degree burns to the face, head, ears, scalp, neck and both arms from elbows down. Patient non-recognizable.

Laboratory Examination: Urinalysis: —Specific gravity, 1.015; albumen, a trace.

Treatment: Light penetration by deep therapy lamp one to two hours daily, followed by ultraviolet, air cooled, given at variable distances and variable time, depending upon parts treated, as there was so much involved, including eyes, ears and nose, that several exposures were necessary at each treatment. Water cooled ultra-violet was used when and where necessary during the course of treatment. The only dressing was rubber tissue between the fingers at night to keep them from sticking together. A rubber covered pillow was used to rest the hands upon so they would not stick to the bed clothing. This patient had a few doses of morphine during the first few days, and, although urine contained some albu-

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THE QUARTZ LAMP

Ultra Violet Light **Quartz Light Therapy**

Published by The Alpine Press, Inc., Newark, N. J., U. S. A., for Hanovia Chemical and Manufacturing Company, Newark, N. J., U. S. A. (Copyright). British Hanovia Quartz Lamp Co., Ltd., Slough, Bucks, England. Nippon Hanovia Sekiei-to Kabushiki, Kaisha, Tokyo, Japan. Quarzlampen Gesellschaft, m. b. H., Hanau, a. M., Germany.

VOL 4 No. X. OCTOBER 15, 1926 ISSUED MONTHLY

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IRRADIATED ORANGE JUICE, ITS VALUE AS AN ANTIRACHITIC AGENT.

Herman L. Maslow, David H. Shelling and Benjamin Kramer

From The Harry Caplin Pediatric Research Laboratory, The Jewish Hospital of Brooklyn, N. J.

It has been conclusively shown that substances which are not capable of preventing or curing rickets may acquire antirachitic properties when exposed to ultraviolet light. The studies of Hess and Weinstock (1), confirmed by others (2), indicate that cholesterol and phytosterol, and presumably substances containing these ingredients, may be endowed with antirachitic potency by irradiation, so that when fed to rats, along with a rickets-producing diet, the animals fail to develop the disease. Kramer (3), Cowell (4), and Gyorgy (5) have shown that irradiated cow's milk will cure rickets when fed to rachitic children; and Steenbock (6) obtained similar results with rats.

The possibility of producing an agent which besides being antiscorbutic would also be capable of preventing or curing rickets centered our attention on irradiated orange juice, since it has been shown by Zilva (7) that irradiation of lemon juice for as long as eight hours does not impair its antiscorbutic potency. Our experiments were therefore concerned with the cure of experimentally produced rickets in the rat by administering irradiated orange juice along with a standard rickets-producing diet.

Experimental

Twenty-eight rats, all of about the same age (25 to 28 days) and nearly of the same weight (25 or 35 grams) were divided into four groups and kept on a rickets-producing diet for 25 to 28 days. Two groups received McCollum's diet No. 3143 (8), and the remaining two groups were fed Steenbock's diet No. 2965 (9). All the animals were kept in a dimly lit room. At the end of this period groups I and III received irradiated orange juice for from 5 to 15 days. Groups II and IV were used as controls and received non-irradiated orange juice. At the expiration of the experimental period the animals were weighed, anaesthetized and bled to death. The organs were examined grossly, special attention being paid to the long bones and thorax. Thin sections of the upper part of the tibiae were immersed in 1 per cent. silver nitrate and examined under the dissecting microscope for the presence or absence of healing as evidenced by the "line test" (10). Blood phosphorus determinations were made at once on the serum of most of the animals.

The orange juice used in our experiment is a commercial product known as "Mission Orange Juice." The manufacturers informed us that it is made by grinding peeled oranges and then concentrated by partial evaporation. On analysis it was found to contain 0.12 per cent. oils and fats and 0.31 per cent. ash. This concentrated juice was mixed with two parts of distilled water and then divided into two portions, one of which was irradiated for three hours under a mercury vapor quartz lamp at a distance of 18 inches. The finished product was kept on ice and fed to the animals daily in quantities averaging about 15 cc. per animal per day.

Results

When rachitic animals are fed irradiated orange juice, healing may be present after five days and is almost complete at the end of fifteen days. Those fed on non-irradiated orange juice showed either no healing or only small deposits of calcium salts in places about the cartilage cells, but none in the metaphysis.

The inorganic phosphorus of the serum in the majority of the animals was higher in those receiving irradiated orange juice than in the controls. Serum calcium determinations were not made, but we may assume, from previous studies of Howland and Kramer (11) and others (12) that in experimental rickets produced by feeding a diet high in calcium and low in phosphorus the serum calcium is about 10 mg. per 100 cc. in the control animals as well as in those treated with various antirachitic agents.

This calcium value and our phosphorus findings indicate that healing occurred at a Ca $\times$ P product above 30, as orginally observed by Howland and Kramer (13). They have shown that in active rickets the product of the concentration of the calcium and the inorganic phosphorus of the serum expressed in mg. per cent. is always below 30, and as soon as healing occurs this product invariably rises above 35. However, in one group of our animals to which orange juice was fed for a period of 10 days marked healing occurred at a serum phosphorus of 2.6, or presumably at a product of 26; while the control animals with active rickets and with no healing had a serum phosphorus of 2.8. On careful microscopic study of sections of the upper part of the tibiae of the animals of this group, it was found that healing did not occur regularly at the ends of the epiphyseal cartilage as is usually encountered. Instead, the healing was most pronounced in the middle of the osteoid metaphysis while the cartilaginous processes were almost free from calcification. A similar observation has been made by de Bosanyi (14) who also found a marked healing of rickets with a low serum phosphorus in animals treated with adrenalin. These findings, therefore, raise the question as to whether or not there are two types of healing in rickets, namely: (1) where the healing begins at the ends of the epiphyseal cartilage and spreads downwards into the osteoid metaphysis and is usually associated with an elevated serum phosphorus, and (2) where healing begins in the middle of the metaphysis and occurs at a relatively low serum phosphorus. This observation warrants further study.

Conclusions.

The present experiments are of preliminary nature and only serve to demonstrate that: 1. Antirachitic properties can be imparted to orange juice by irradiation with the mercury vapor quartz lamp. 2. After feeding of irradiated orange juice to rachitic rats healing may be demonstrated as early as five days and is almost complete at the end of fifteen days.

Experiments are now in progress to ascertain: 1. The antirachitic value of irradiated orange juice in the cure of rickets in children. 2. The effect of irradiation on the antiscorbutic factor of orange juice at various reactions (pH). 3. The length of time during which irradiated orange juice retains its antirachitic properties.

(*Abstrated from Bulletin of The Johns Hopkins Hospital, Vol XXXIX, No.* 1 *pp.* 56-61, *July,* 1926.)

RECENT PROGRESS IN PHOTOTHERAPY AND APPARATUS

Report of Committee on Phototherapy and Apparatus.
Frank Thomas Woodbury, M.D., Chairman, New York City.

Your Committee respectfully repeats its recommendation of last year for a standardized nomenclature for accuracy of description. In this regard, your Committee believes that its own title should be changed to read "The Committee on Heliotherapy and Apparatus."

Your Committee desires to issue a warning to manufacturers of apparatus for producing radiant energy intended for therapeutic use that they refrain from trying to obscure the facts, in their commercial enthusiasm, by using pseudo-scientific propaganda or by engaging in unfair comparisons between their products and the products of others.

So far as the physician is concerned, his interest is solely in clinical results. These results are obtained in heliotherapy in three ways—(1) by the exhibition of actinic effects of ultraviolet radiation, or (2) by the conversive heat effects of radiant energy, or (3) by combinations of actinic and conversive heat effects. There is a fourth, a field at present but little explored, concerned with the effects of radiations from portions of the visible part of the spectrum obtained by the use of special kinds of filters, which, being standardized by the manufacturers, makes it easy to compare results. Dr. Balderrey will give us some of those results to-day. To resume, when the generator or lamp emits a preponderance of ultraviolet rays and an inconsiderable amount of longer wave lengths, we speak of it as a source of ultraviolet radiation. Such are the mercury vapor electric arc of Peter Cooper Hewitt, which is air cooled, and the water cooled lamp invented by Kromayer, and the tungstun arc. These are standard and are put out by manufacturers under various names. When the generator emits caloric rays only we speak of it as a source of conversive heat. Such are generators called black body, which emit ultrared rays only, the incandescent electric coil heaters, the carbon filament, and other types of incandescent electric lamps, which emit visible and ultrared rays, both of which, however, become conversive heat when absorbed.

When the radiant energy is a mixture of electro magnetic wave lengths varying from 185 Millimicrons to five (or more) microns in the ultrared region, we get actinic rays in combination with caloric rays of a nature approximating solar radiation more or less. Such generators are the various reinforced carbon and tungsten arcs. These then are the three main divisions of radiant energy coming within the pervue of your Committee.

Your Committee believes that using such terms as "infrared therapy," "non-burning sun therapy," etc., as though these had peculiar and special virtues, is misleading and not fair to the physician, especially when he is asked to pay such exhorbitant prices for a treatment equally well obtained from less expensive sources. The profession has had the same experience in the field of drugs, where a substance relatively cheap assumed marvelous qualities when sold under a trade name and at a high price. Your Committee would emphasize the fact that all heated substances give off electromagnetic radiation; the hotter they are the greater the volume of total radiations they will give and the greater the proportion of ultrared rays, although the smaller wave lengths increase more rapidly as the tem-

perature rises, until we finally reach incandescence. It is absolutely unimportant, from the therapeutic point of view, whether the source contains visible as well as invisible rays, provided they are absorbed and cause conversive heat. The important point is that such radiations penetrate tissue directly as the wave length and wattage, and directly as the square of the distance and the angle of obliquity. Ultrared rays penetrate deeper only because they have longer waves than luminous ones. Therefore they reach deeper tissues and create heat there, being converted into molecular kinetic energy, which excites hyperemia, the real object of our treatment. These rays are not hot air, but are electromagnetic waves of the ether, or rontgen rays, gamma waves, or radio waves, all traveling 186,000 miles per second. *It is impossible to use any heated source* for radiations without producing ultrared rays. For example, the sun rays contain eighty per cent. ultrared energy at sea level; the mercury vapor electric arc produces fifty-two per cent. ultrared rays from the heated quartz burner; while incandescent electric lamps, especially the carbon filament, produce ninety-three per cent. ultrared ray energy.

Dosage, however, is the product of quantity multiplied by time of application. A dose with a weak lamp for a long time may equal in therapeutic effect a dose using a powerful lamp for a limited time. The question then is, which is the most practical and cheap source of radiant energy for the physician. A thermolite lamp, or electric coil heater, or a carbon filament electric lamp with a reflector may all furnish ultrared radiation to serve the purpose, as well as more expensive apparatus.

Your Committee regrets to issue this warning, but feels it necessary as there have appeared upon the market five or six radiators, not one of which is superior in producing radiant conversive heat for therapeutic purposes to the carbon filament electric lamp or the electric coil radiator.

Your Committee also feels that physicians should be careful in the selection of their terms in describing the use of radiant energy. It would be better to give the name of the lamp, rather than to use such silly terms as "quartz rays," "invisible light," etc. The use of the word "light" to include invisible radiation is a slovenly perversion, which should not be countenanced by scientific men, since it might just as well be applied to x-rays or radio waves. Again, the literature abounds with expressions such as "the longer rays of the spectrum," "the shorter rays of the spectum," when wave length region is meant. A ray is a succession of two or more waves found along the axis or radius of propagation. These rays are all the same length—infinity—provided the mission is continuous, as from a star. If, however, they have an intermittent source, such as the x-ray tube, they come off in wave trains of varying length. Suppose, for example, a lantern be obscured regularly for one second and uncovered for one second alternately, like a lighthouse. The beam or ray emitted during the moment of illumination, if unobstructed, will be at the end of one second 186,000 miles in length, made up of a mixture of many wave lengths according to the temperature of the lamp. To speak of the short rays of the spectrum is, therefore, nonsense. Again, referring to the left end of the spectrum or to the right end of the spectrum is meaningless, as the orientation of the spectrum depends entirely upon the position of the prism through which the rays pass.

To review the literature of the year would produce a report too long to be read. We may divide our survey into pure ultraviolet therapy, pure ultrared therapy, and heliotherapy natural and artificial.

Physics.

The Hanovia Company has produced a filter for the short ultraviolet. It is comparatively easy to filter out the short rays of the ultraviolet spectrum and transmit the longer. However, the converse, to transmit the shorter and filter out the longer, has been exceedingly difficult to do. This filter provides a means of almost completely screening out the long ultraviolet rays, such as are found in sunlight, and transmits the short wave lengths of the quartz lamp. It is the only filter at present known that will do this. This consists of a definite mixture of certain gases imprisoned within a transparent fused quartz container, lens shaped.

No other clinical substitute for this Finsen apparatus has been found except the Kromayer water cooled mercury arc lamp in quartz. The difference between rays from the carbon arc and those from the mercury vapor arc is considerable. The former comprises all the rays of the (visible) spectrum, while the latter include mainly ultraviolet, and particularly the very short wave ultraviolet rays.

Metabolism.

Leslie Clough says, in an Athletic Bulletin published by the Hanovia Company, that the mercury vapor arc is of almost unbelievable benefit in training by promoting and stabilizing metabolism through assisting in the oxygenation of the blood and the elimination of fatigue producing agents. It is also a valuable aid in the treatment of injuries, as it destroys germs in from one to five minutes, thereby lessening materially the probability of infection in wounds and contusions. Once used and understood, no trainer would attempt to do without this modality, as it is perfectly harmless and will not destroy tissue. It is being used by the New York American League Baseball Club, American Universal Boat Club, University of Chicago Football Squad, etc., etc.

L. Livet (The Treatment of Obesity by Means of Ultraviolet Reys, La Clinique, March, 1924), states that the ultraviolet rays constitute a means of treating obesity far preferable to all other methods. By their use the author has secured, with an average of thirty to forty treatments, a loss of weight varying from six to twenty kilograms. The reduction begins in a few days after the manifestation of cutaneous erythema. The action of the red and ultrared rays favors the establishment of a cutaneous hyperemia and the penetration of the ultraviolet rays; therefore it is good practice to apply them simultaneously. A point of particular importance is that persons subjected to the ultraviolet rays have no need to alter their diet, to take medicines and purgatives, nor to undergo fatiguing exercise.

Abstracted from Physical Therapeutics, Vol. XLIV, No. 9, September, 1926).

TETANY.

P. Drucker and F. Faber (J. Biol. Chem., 68, 57-68 (1926).

The hypocalcaemia observed during tetany in children is not due to alkalinity of the blood, since neither the Ph nor the hydrogen carbonate shows significant variations from the normal. During tetany, whether or not ammonium chloride is being administered, the concentration of ionised calcium as calculated from the equation of Rona and Takahashi (A., 1913, i, 544) may be greater than the concentration of total calcium actually observed; this indicates that the blood, under these conditions, is not saturated with calcium and that the above mentioned equation is not applicable. Administration of calcium chloride causes a greater increase in the calcium of the blood than either ammonium chloride or calcium lactate, since it promotes acidosis at the same time that it

acts as a source of supply of calcium. Irradiation of tetanic patients with ultraviolet light raises the calcium of the blood to normal level; moreover, after such treatment the calcium-ion concentration, calculated by the above equation is normal, so that it is assumed that the blood has become saturated with calcium.

C. R. HARINGTON.

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THE QUARTZ LAMP

Ultra Violet Light — Quartz Light Therapy

Published by The Alpine Press, Inc., Newark, N. J., U. S. A., for Hanovia Chemical and Manufacturing Company, Newark, N. J., U. S. A. (Copyright). British Hanovia Quartz Lamp Co., Ltd., Slough, Bucks, England. Nippon Hanovia Sekiei-to Kabushiki, Kaisha, Tokyo, Japan. Quarzlampen Gesellschaft, m. b. H., Hanau, a. M., Germany.

VOL 4 No. XI. NOVEMBER 15, 1926 ISSUED MONTHLY

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CLINICAL APPLICATION OF ULTRA-VIOLET LIGHT.

By Edwin T. Wyman, M.D., Boston, Mass

Rollier of Lysin and Bernhard of Samaden deserve the credit of re-establishing heliotherapy as a therapeutic measure of value. We are especially indebted to Rollier, for he, after fifteen years' experience and careful observations, was the first to lay down a well defined scheme of carrying out heliotherapy. The essential point of his routine treatment is to gradually increase the exposure of small areas of the body to the sun's rays until the entire body is exposed. Thereafter the patient receives a daily sun-bath of from three to five hours.

While Rollier obtained his best results in surgical tuberculosis, he recommended its use in all forms of tuberculosis, wounds healing poorly, skin lesions, such as ulcers, intertrigo and some cases of eczema, primary and secondary anemias of children, infantilism and debility of unknown origin and rickets. In pulmonary tuberculosis he employed special care and selected only patients with little or no febrile reaction.

In New England it is impracticable to expose an infant to the direct rays of the sun and it is oftentimes inadvisable to expose older children, except during the warm summer months, on account of the cold and consequent loss of body heat. This difficulty, however, may be overcome when a quartz window or a glass which is transparent to the ultra-violet rays is available at a reasonable price so that the baby can have its sunlight treatment in a warm room.

The ultra-violet rays in the sun's spectrum vary in intensity during the different seasons of the year, being highest during the summer months and lowest during the winter months.

It is believed that this seasonal variation is due to the absorption of the shorter wavelengths by the atmosphere. In New England during the winter months it is questionable whether or not there are sufficient ultra-violet rays in the sun's spectrum to be of much therapeutic value. At present during the winter months and on cloudy days in summer, it is necessary, in treating infants, to use a substitute for sunlight. The mercury vapor quartz lamp at present surpasses all other sources in ultra-violet efficiency and is the best means of artificially producing rays similar to the short therapeutic rays in the sun's spectrum. The sun's spectrum ends abruptly at about 296 millimicrons, due to the absorption of all shorter wave lengths by ozone in the atmosphere. The mercury vapor quartz burner emits ultra-violet radiation, consisting of a continuous

spectrum between 185 and 400 millimicrons, upon which is superimposed the mercury arc line spectrum, the principal lines of which are at 364, 313, 302, 280, 265, 240, 200 and 185 millimicrons. There are many other lines, but those mentioned above are the most intense. The two lines at 265 and 255 are especially strong. The line at 364 is the strongest line of the mercury ultra-violet spectrum. Experiments with light filters in irradiating cholesterol solutions seem to show that rays of 302 millimicrons or less are necessary to confer antirachitic property.

We are now using Alpine sun burners in the out-patient department and medical wards of the Children's Hospital when individual treatments are given. In the Infants' Hospital we are using a room with four Burdick lamps suspended near the ceiling, arranged to give as even a distribution of light as possible over the cribs. This permits us to treat a number of patients at the same time. The room contains ten cribs. The individual treatments are given with the lamp at a uniform distance of 20 inches from the surface of the body. The entire surface of the baby with the exception of the head is exposed. The head is protected by a sheet draped loosely over the head of the crib or, when a table is used, the sheet is draped over a frame-work on the treatment table, coming down over the baby's neck. The front and back are given the same exposure. The patients are divided, because of the variation in skin tolerance, according to their complexions—light, medium, dark and black. When individual treatments are given with the Alpine Sun Burner, the light complexioned patients are started at two minutes' exposure, front and back, and the time of exposure increased two minutes, front and back, each treatment until the total exposure of twenty minutes, front and back, is given. The medium complexioned patients are started at three minutes' exposure, front and back, and increased three minutes, front and back, until the total exposure of twenty-five minutes, front and back, is given. The dark complexioned patients are started at four minutes, front and back, and increased four minutes, front and back, until a total of thirty minutes, front and back, is used. The black or negro babies are started at five minutes, front and back, and increased five minutes, front and back, until a total of thirty-five minutes, front and back, is given.

In the light room of the Infants' Hospital, equipped with four Burdick lamps suspended from the ceiling, having a vertical tube distance (from the patient to the burner) of 7 feet 6 inches, the same method of exposure is used as with the individual treatments, except that the total exposure of the light complexioned patients is increased to thirty minutes, front and back; the medium complexioned babies to a total of forty minutes, the dark complexioned patients increased to fifty minutes, and the black or negro patients' exposure is increased to a total of sixty minutes, front and back. The ward patients are given daily treatments while the patients coming into the out-patient department are given treatments three times a week. This method of treatment is used in all types of cases. The time of exposure has to be shortened occasionally on account of a very delicate skin. The time given above for individual treatments with the Alpine Sun Burner is longer than should be used when new burners are employed, as the efficiency of our burners has diminished with length of service.

SUN BATHS.

When direct sunlight is used, we use the following scheme of exposure:

Infants—The sun-bath can be given in a room with the sunlight coming through an open window, on a veranda or sun-porch or in the shelter of a garden or yard. If given in the open the infant should be protected from the wind by a cloth screen on three sides. A sheet draped on three sides of the crib will do, although it is better to have the shelter 4 or 5 feet high. On cool days the hands and feet should be kept warm by means of mittens and socks, and a hot water bottle or an electric pad can be used to maintain the body heat. By means of an open window or door the bath can be given in a warm room, free from drafts. In starting the treatments the infant should wear a diaper, band and shirt. The head and nape of the neck should be protected from the direct rays of the sun by a sun-shade, cotton hat or a sheet draped over the head of the crib. During July and August the bath should be given between 8 and 10 A. M., or between 2 and 4 P. M. In June and September it should be given in the middle of the day. At the start the baths may be given two or three times a day and, as the length of exposure increases, the number of baths are gradually decreased to one or two a day, depending on the complexion of the patient and the intensity of sunlight.

SCHEME OF EXPOSURE.

The legs and lower thighs are exposed to the direct sun's rays for five minutes, front and back. The exposure is increased five minutes, front and back, each day until on the third day the legs and lower thighs are exposed for fifteen minutes, front and back. On the fourth day the diaper is removed after the legs and thighs have been exposed for fifteen minutes and a total exposure of twenty minutes is given to the front; then the diaper is replaced and the exposure is repeated to the back. The exposure is increased five mniutes each succeeding day until on the sixth day a total exposure of thirty minutes is given to the front and the back. On the seventh day the diaper is removed after the legs and thighs have been exposed for fifteen minutes; then, after a total exposure of thirty minutes, the band and shirt are removed and the exposure continued for five minutes longer until a total exposure of thirty-five minutes is given to the front. The diaper, band and shirt are replaced and the exposure repeated to the back. On the succeeding days this same scheme is followed, increasing the total exposure five minutes each day until on the twelfth day a total exposure of sixty minutes is given to the front and the back. On the following days the diaper, band and shirt are removed five minutes earlier in the exposure each succeeding day so that on the fifteenth day the diaper is removed at the beginning of the bath and the shirt and band are removed after 15 minutes' exposure. On the eighteenth day the diaper, band and shirt are removed at the beginning of the bath and a total exposure of sixty minutes is given to the front and sixty minutes to the back. After the eighteenth day general exposures of one hour to the front and one hour to the back are given.

Children.—The same scheme is used with children. First the legs and thighs are exposed, then the abdomen from the ribs to the hips, and last the chest.

This scheme shows the usual progression in normal cases; it does not represent a hard and fast rule and can be varied depending on the general condition of the patient, the tolerance to sunlight, temperature and wind, height of the sun and clearness of the atmosphere. It is better for patients whose skin burns very readily to take shorter treatments, three or four a day, to more gradually accustom the body to the sun. Many patients with dark skins can withstand twice the exposure given in the table. The whole object of the scheme is to get the patient well tanned without sunburn.

RICKETS.

Rickets occurs universally in northern civilized countries such as Europe and North America, where there is lack of sunlight during the winter months. The seasonal variation in the recurrence of rickets offers striking evidence of the part

sunlight plays in the prevention of the condition. Rickets flourishes generally under poor hygienic surroundings and especially under conditions where direct exposure to the rays of the sun is infrequent or entirely absent. Rickets can be cured both clinically and in experimental animals with certainty by the administration of cod liver oil. It can also be cured with certainty by the action of ultra-violet light. Palm, in 1890, recognized the full importance of the lack of sunlight in the etiology of rickets and gave remarkable recommendations for the eradication of the disease by means of sunlight. Radzyinski wrote, in 1912, "it is the sun that plays the principal role in etiology of rickets," and he gave the first proof of the favorable influence of light on metabolism by an experiment on puppies. In June, 1919, Huldschinsky reported that the ultra-violet ray therapy exerted a curative action in human rickets. He treated four children, who had advanced rickets, with the mercury vapor quartz lamp and found that at the end of four weeks it was possible to demonstrate by X-ray the deposit of lime salts at the ends of the long bones of the extremities, and at the end of two months the healing was almost complete. The discovery of Huldschinsky of the curative action of light in human rickets has been corroborated by numerous other investigators. Hess and Weinstock have made the remarkable discovery that such oils as cottonseed and linseed, which do not protect animals from rickets, and green vegetables, which have little or no antirachitic properties, can be endowed with antirachitic potency by exposing them to the radiation from a mercury vapor quartz lamp.

The result of many studies has led to the conclusion that the chemical substances which can be activated by ultraviolet rays are cholesterol in animal foods and phytosterol in vegetable foods. These substances are present in almost every vegetable and animal cell.

In 1923 a special clinic for the treatment of rickets with the mercury vapor quartz lamp was started in the Out-Patient Department of the Children's Hospital, Boston. This clinic has been carried on since that time, except during the summer months when the patients are given daily sun baths at home in place of the Alpine lamp treatments. In this time, we have treated about two hundred cases of rickets (varying in severity) with universal success. We concluded after treating a number of rachitic patients with ultra-violet irradiation and a number of rachitic patients with both ultra-violet light and cod liver oil, that the combination of cod liver oil and ultra-violet light probably hastened the healing process more than either ultra-violet rays or cod liver oil alone. At present, we are treating the moderate and severe cases of rickets with both ultra-violet irradiation and cod liver oil. The mild cases are treated with cod liver oil alone, as it seems unnecessary to have the patient make extra trips to the hospital for light therapy. The length of time required to cure severe cases, as shown by roentgenograms and the serum calcium and phosphorus concentration, is from six to eight weeks. They are then discharged from the "light clinic" and cod liver oil is continued to prevent a recurrence of the disease.

SPASMOPHILIA.

Spasmophilia is a nutritional disease characterized by convulsions, carpo-pedal spasms, laryngismus stridulus and an extreme irritability of the nervous system to mechanical and electrical stimulation. The blood chemistry shows a low serum calcium concentration. It has been made quite clear that all cases of infantile tetany have rickets, but all patients with rickets do not have tetany. To treat an established spasmophilia one must use measures that will increase the blood calcium rapidly and permanently. Ultraviolet therapy has been shown to exert a favorable influence in tetany. These rays not only influence the symptoms favorably but the symptomatic relief is paralleled by a return of the calcium concentration in the blood serum to normal. The treatment followed at the Children's Hospital is to give calcium chloride, ten to twenty grains three times a day, in addition to ultra-violent irradiations. The result has been uniformly good. If rickets is present to a marked degree, as is often the case, the treatments are continued until the rachitic processes are healed. After the patient is discharged from the "light clinic," cod liver oil is continued to prevent the recurrence of rickets, and calcium chloride is continued for a time to prevent the recurrence of tetany. The time required to cure the average case is from ten days to two weeks.

TUBERCULOSIS.

Gerstenberger and Wahl and others found the ultra-violet ray of decided value in the treatment of peritoneal, glandular and osseous tuberculosis. They think that of the glandular forms the mesenteric was most rapidly improved: next the mediastinal, and last, the peripheral. Beneficial results were not obtained in pulmonary tuberculosis of the miliary type, although treatments were begun early. The patients we have treated for tuberculosis of the mediastinal glands and tuberculosis of the mesenteric glands have responded well to ultra-violet therapy. The treatments have seemed to improve their general condition, to relieve the symptoms, such as cough in the bronchial cases and abdominal pains in the mesenteric cases, and to favor early calcifications of the glands. Our results in the cases of tuberculous peritonitis have been variable. It is not expected that ultra-violet therapy will cure all cases of tuberculous peritonitis. However, our cases show that it is a valuable therapeutic measure. We believe that it should be used unless there is marked febrile reaction. It is much more difficult, in treating tuberculosis and many other diseases with ultraviolet rays, to draw definite conclusions as to the benefits obtained from this form of therapy, because in rickets and tetany the blood chemistry and X-ray give confirmatory evidence of recovery. One has to depend almost entirely on clinical findings to note the progress of the case and it is often difficult to tell how much the disease has been influenced by the rest, fresh air, proper nourishment and general hygiene given as routine treatment in addition to the ultra-violet rays.

PSORIASIS.

We have observed marked improvement in all the patients treated for psoriasis while they received treatment.

FURUNCULOSIS.

Our results with furunculosis have been favorable, although in most cases the improvement was no more marked than when the ordinary treatment was used. Some persistent cases, which did not respond to vaccines and local treatment, cleared up rapidly, however, with ultra-violet therapy.

ECZEMA.

We have not found this form of therapy useful in cases of eczema, although in some instances, with additional infection of the skin, the germicidal properties of the light helped to clear up the infection.

BRONCHIAL ASTHMA.

We have used this form of therapy in a case of bronchial asthma in which the child has a sensitization to bacteria. After other forms of treatment had failed, ultra-violet irradiations had a most beneficial effect. The attacks have become less frequent and less severe and the patients were improved in all respects.

CONCLUSION.

In conclusion it can be said that the quartz lamp can be used as a substitute for sunlight and has the advantage of being available regardless of sunshine and weather. It can be given in-doors so as not to subject the infant or child to the

cold, and the doses can be more accurately gauged. There is, however, a very real danger of becoming too enthusiastic about ultra-violet therapy rays lest this form of treatment be looked upon by the physician and his patient as a quick and sure cure for all ailments. It can be said, however, that ultra-violet light therapy has a specific action in treating rickets and spasmophilia and is a valuable therapeutic agent in the treatment of tuberculosis of the mesenteric and bronchial glands and tuberculous peritonitis. Further investigations will be required in other fields before definite conclusions can be drawn.

(*Extracted from The American Journal of Physical Therapy, Vol.* 3, *No.* 6, *Sept.,* 1926, *p.* 261.)

October 18th to 23rd, 1926.

THE BACTERICIDAL ACTION OF ULTRAVIOLET LIGHT.

H. H. Hawze.

(*Extract from Am. Rev. of Tuberculosis, Vol. XIII, No.* 5, *May,* 1926.)

SUMMARY AND CONCLUSIONS.

1. It has been shown by many workers that ultraviolet light is bactericidal to various microorganisms, but Mayer and Dworski are the only ones who claim to have shown its bactericidal properties for tubercle bacilli heretofore.

2. Changes in the temperature of the surrounding medium of the microorganisms may slightly alter the bactericidal action.

3. Changes in the H-ion concentration of the medium probably plays no part in the bactericidal action.

4. The tubercle bacillus can be rendered non-acid-fast by ultraviolet light. This might explain some of the good results secured in the treatment of tuberculous infections with the quartz lamp.

5. From the results obtained in this experiment it is concluded that the irradiations of the mercury-quartz-vapor lamp used are bactericidal for the tubercle bacillus after an exposure of five minutes at a distance of ten inches from the burner. No attempt is made to explain this bactericidal action.

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The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy *Published by Alpine Press Inc.*

VOL. 5, No. II FEBRUARY 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

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ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth of each month One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., Newark, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
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Kaisha, Tokyo, Japan
QUARTZLAMPEN GESELLSCHAFT, m. b. H.,
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NEWARK, N. J., FEBRUARY 15, 1927

TREATMENT OF EXTENSIVE PULMONARY TUBERCULOSIS WITH ULTRAVIOLET RAYS

By Henry J. Gerstenberger, M.D., and
Charles W. Burhans, M.D., Cleveland

In a previous communication, one of us has reported favorably on the nonspecific but decidedly beneficial effect of the ultraviolet ray as produced by the mercury quartz arc, on peritoneal and glandular tuberculosis, and adversely on pulmonary lesions of the miliary type. Our experience has not changed in this regard. Consequently we were much surprised when the first patient of this series, M. M., did not become worse, and actually recovered while being treated with mercury quartz ultraviolet rays. Before this method of treatment was instituted the patient had been in bed at rest for six months, and had received a wholesome diet containing enough milk, orange juice and cod liver oil. Soon after admission to the hospital he improved, but only temporarily. He got much worse, lost weight, had high fever, developed a phlyctenular conjunctivitis and an exudate into the peritoneal cavity. The whole picture changed soon after the quartz lamp therapy had been started. It is true that he had been gaining in weight again two weeks before the actinic ray therapy was begun and, therefore, it is impossible to say whether or not he would have continued to improve. However, he had improved and had gained in weight similarly on a number of previous occasions, only later to become generally worse. Consequently we have the distinct impression that this patient was benefited by the use of the quartz lamp. At any rate, we can be positive that no harm was done, as his gain in weight, the improvement in his general condition, the disappearance of fever and the gradual clearing up of the lung exudate from this time on were remarkable in degree and in constancy.

This experience encouraged us to treat additional cases of pulmonary tuberculosis. In order to make possible an attempt at the evalution of the therapeutic powers of the actinic rays, the patients were exposed only to the quartz mercury arc lamp and were kept in bed and indoors; in other words, exposure to outside air, sunlight or to the carbon arc light was avoided in each instance. Whether the rays produced by the carbon arc are superior in the treatment of tuberculosis to those of the quartz mercury arc we do not know. We are convinced, however, that those who deny that the actinic rays have any therapeutic value in tuberculosis are in error. The experience that we had in treating tuberculous peritonitis and tuberculosis of the mesenteric glands with a quartz lamp, as previously reported, is primarily responsible for this conviction, as it was easier in these cases to judge and to follow the improvement obtained than it has been in patients ill with pulmonary involvement.

Case 5 (D. T.) is the one case in which it might be maintained that the ultraviolet ray therapy did no good and possibly did some temporary harm. On this patient's admission, at the age of 2 months, with a weight of 2,500 Gm., the tuberculin test was positive, but only to a 0.1 dilution. The roentgenogram was practically negative, although in the left upper side of the chest a faint haziness was present, quite similar to that produced by a former attack of pleurisy. Three weeks after admission, a slight mottling in the upper right lobe appeared. At this stage the quartz lamp therapy was begun. Two months later, an infiltration that was dense and extensive was found in the right upper lobe. In two additional months a cavity appeared in the center of this area. The exposure to the quartz lamp was continued notwithstanding, and in another two months the cavity had disappeared and the area of consolidation had been reduced in size but was more dense. Later on, the lung area cleared entirely leaving, however, as is so frequently the case, a rather large mass of bronchial and peritracheal glands.

Whether the quartz lamp hurried the infiltration and cavitation, and whether this was good for the patient or not, we cannot state. We do know, however, that the temperature became normal immediately after the cavity appeared and that the final end-result was excellent. Consequently, we are convinced that at least no harm was done.

In cases 2, 4, 5 and 6, the lung fields were clear at the end of one year, and in case 1, at the end of two years. In case 3 there was still slight cloudiness at the end of one year, and in case 7 there remained at the end of this time in the right upper hilum region a dense shadow which was not entirely due to enlarged glands and which looked like a small mass of much shrivelled lung tissue.

In the cases in which the lung fields cleared best, the peritracheal and bronchial glands were largest at the end of the observation. What significance, if any, is to be attached to this observation we do not know. In this connection, however, it should be mentioned that Kleinschmidt has offered a theory for the mechanical development of exudates in the lungs as a result of obstruction to the glands which are supplied by that area. Case 6, in addition, showed a slight widening of the hilum shadow on the opposite side, and in case 3 the hilum shadow on the right side was somewhat widened and sharpened.

The ages of the patients on admission were as follows: 2, 5, 6, 10, 13, 16 and 17 months, respectively.

The left upper lobe was involved in two cases, the right upper lobe in three, the right and left lower lobes in one, and in one case the shadows were not very dense and followed the bronchial tree on both sides, radiating out from the hilum regions. All three of the right upper lobe cases reached the stage of cavity formation.

In four cases the 1:1,000 intracutaneous tuberculin test was 3 + positive. Two of these patients developed a tuberculous peritonitis, and one presented a cavity in the right upper lobe in addition. In one case the 1 : 1,000 intracutaneous tuberculin test was 1 + positive. This patient also had a cavity in the right upper lobe. A sixth patient had a 1 + positive 1:100 intracutaneous tuberculin test, and a seventh patient a 1 + positive 0.1 intracutaneous tuberculin test. The last patient was the third to go to the stage of cavitation.

From these observations it is evident that there existed no correlation in our cases between the degree of sensitiveness to the tuberculin test and the extensiveness of the tuberculous process in the lung. Both patients who developed a tuberculous peritonitis possessed a marked degree of sensitiveness to the tuberculin test, notwithstanding that one of them had a large cavity in the right upper lobe. One of these also developed a phlyctenular conjunctivitis.

It is interesting to note that, on admission, all of our patients except one were in a poor state of general health and of nutrition, and that, notwithstanding, all gained in weight at a satisfactory rate once continuous improvement had begun, except one patient (case 7), who was so sick that it was not believed that he possibly could recover. However, although his weight curve does not compare favorably with that of the others, the change for the better that developed in his disposition and his attitude toward his environment was outstanding.

It will be noted that all of the patients except those in cases 3 and 6 received cod liver oil in some form in their diet (cod liver oil, Protein S.M.A.). In case 6, the cod liver oil intake in the form of Protein S.M.A. did not begin until three months

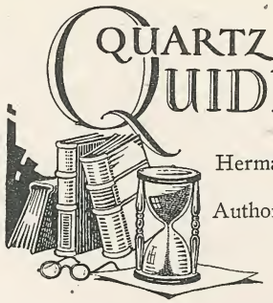
after admission. Ultraviolet therapy had been instituted since the first day, and the improvement in general appearance, in the weight curve, in the physical characteristics and in the roentgenograms had begun before the food containing cod liver oil was given. In case 3, no cod liver oil was given, and the ultraviolet therapy was not begun until the beginning of the sixth month in the hospital, at which time the weight curve remained practically stationary for a month, and the roentgenogram showed an extension of the infiltration of the tissue of the lungs on both sides. Before the one month of stationary weight, the infant had gained fairly well in weight, even though at one time he was moderately dehydrated.

All of the reported patients in the cases were exposed at least three times a week to the quartz mercury arc lamp, and it is our impression that they were benefited thereby. It is certain that no harm was done.

Abstracted from Am. Jour. of Diseases of Children, Vol. 33, No. 1, Jan., 1927, pp. 54-73.

PHOTO-THERAPY IN SYPHILIS

In a paper on the combined action of photo-therapy and the usual drug treatment in syphilis, Ravant, Basch and Lambling recommend the use of ultraviolet rays as an adjunct. They state that although U-V-R have no direct effect upon the symptoms or on the Wasserman reaction, yet there is a distinct favourable influence upon the general health by means of the combined treatment. Whilst the authors are careful to add that actinotherapy alone cannot take the place of specific treatment, they urge its great value as an adjunct.—*Ann. de Dermataet Syph., Aug., Sept.,* 1925. (*via "The Prescriber."*)



By
Herman Goodman, M.D.
New York
Author of *Basis of Light In Therapy*

This column is conducted for the purpose of answering questions on Quartz Light Therapy. Readers are invited to submit such questions to the ALPINE PRESS, Inc., who will endeavor to have them answered by authorities on the subject.

Question: Why do the directions for operation of the mercury vapor arc in quartz (air cooled) insist that the burner be washed with alcohol before use?

Answer: Preliminary washing with alcohol removes dust and grease from the surface of the quartz which would otherwise be burned into the quartz. The burned parts would be impervious to the passage of the ultraviolet rays.

Question: Why must one wait for five minutes before using the lamp therapeutically?

Answer: The mercury vapor arc in quartz reaches efficiency in about that time, and to secure proper bases for comparison, the lamp should be used only after the height of efficiency has been reached.

Question: Is it important to watch the indicator on direct current operating machines?

Answer: It is of paramount importance to examine the indicator switch each time the lamp is ignited. On direct current machines reverse polarity means ultimate destruction.

Question: Does it make any difference what the distance is between the burner and the patient?

Answer: Distance is one of the important factors in therapy. The closer to the source of the energy, in this case the burner, the greater the effectivity. The law of the inverse squares is: from a point source the illumination decreases inversely as the SQUARE of the distance.

Question: Can my eyes become accustomed to the radiation from the mercury arc in quartz?

Answer: The eyes of all those who come within the direct or the reflected radiation from sources of ultraviolet should always be protected. It is not possible to become accustomed to the rays.

Question: What part did Heraeus have in the development of the mercury arc in quartz?

Answer: It was due to the work of Heraeus on fusing quartz in making it commercially available as containers for the mercury which made the therapeutic models possible.

Question: Does the ordinary electric light bulb emit ultraviolet?

Answer: The ordinary electric light bulb (glass) operating at its stated voltage does emit ultraviolet in small amount, but this ultraviolet is NOT the physiological, vital, ultraviolet.

Question: Why do Arctic explorers and mountain climbers suffer from sunburn?

Answer: Sunburn in cold regions is due to the presence of ultraviolet in the sun's rays. It so happens that snow is an excellent reflector of ultraviolet, and intensifies the sunburn action of the sun's rays.

Question: Is the erythema from exposure to the mercury arc in quartz harmful?

Answer: The erythema from the exposure to the mercury vapor arc in quartz is similar to sunburn, but no permanent injury is to be expected.

ULTRA-VIOLET RADIATION

SOME ILLUSTRATIVE CASES

By A. Lisle Punch, M.B., M.R.C.P. London
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and
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Physician to H.R.H The Princess Royal.

The therapeutic value of ultra-violet radiation is now so firmly established that a mere record of cases which have benefited by it does not justify publication. A study of the seven cases dealt with in this communication, however, reveals certain special points in the administration of ultra-violet light and constitutes our justification for recording the cases. Cases 1 and 2 would appear to us to offer evidence of the value of local combined with general treatment. How the local application acts it is difficult to understand, but the whole question of the manner in which ultra-violet radiation brings about its beneficial results in suitable cases is at present a matter of conjecture. The penetrative powers of the rays of the Kromayer lamp are very slight, and, although bactericidal to some extent, their action in this respect is so superficial that it can hardly be by such means that they produce their therapeutic effect.

From an experience of a large number of cases of which Cases 1 and 2 are examples, there appears to us very little doubt that local treatment, when combined with general exposure, plays a very important part in the relief of certain conditions. Case 4 is chiefly of interest in that the symptoms of a condition of a very obscure nature were considerably relieved by ultra-violet radiation. The treatment was entirely empirical, but, where diagnosis is doubtful, treatment must of necessity be empirical.

CLINICAL RECORDS

CASE 1.—Male, aged 51, suffering from widespread genital tuberculosis, involving the epididymides, prostate, and vesicles. A prostatic abscess developed, which threatened to burst into the rectum. Mr. J. Alban Andrews evacuated the abscess and removed the remains of the tuberculous prostate by dissection. In July, 1925, a bilateral epididymectomy was performed. A month later the patient was discharged from hospital. His general condition was good, but urine was leaking from a persistent suprapubic fistula, which was to be repaired later.

The patient was readmitted in October,

1925, the fistula was excised, and the abdominal wall repaired. The great amount of perivesical scar tissue rendered mobilsation of the bladder difficult, so that the space immediately behind the symphysis pubis could not be completely obliterated. This was drained. Three days later an abscess developed and discharged through the lower end of the suprapubic wound. Again a suprapubic fistula was established, although there was no urethral obstruction. Urine contained pus in large amounts.

When first seen on December 10, 1925, both seminal vesicles were hard and clinically tuberculous. There were two suprapubic fistulæ, from which urine leaked. They were surrounded by dense scar tissue, and the lower one was depressed below the surface. Over these the patient was wearing pads of wool, which had frequently to be changed, and there had been no alteration as regards this since the operation.

Treatment by ultra-violet radiation was begun on December 10, 1925, daily at first, and, later, with a few days interval. General treatment by the mercury-vapour air-cooled lamp was given on the first nine occasions, with exposures varying from 2 to 20 minutes at a distance of 36 inches. Local treatment was given by means of the Kromayer water-cooled lamp, short contact exposures being made with a quartz rod or quartz lens to the fistulæ. In all, 28 treatments were given over a period of 13 weeks, the later general treatments of the air-cooled mercury-vapour lamp.

The fistulæ have now closed, the patient has put on over a stone in weight, and has returned to his work as a blacksmith. It was found necessary from time to time to give local treatment, as, if this was suspended, there was a tendency for the condition to become stationary. After each local treatment there was a definite diminution in leakage after a temporary increase lasting about 24 hours.

This case seems to demonstrate clearly that the local treatment played a very important part in the cure.

Case 2.—Male, aged 45. Had a chronic discharging fistula of the thorax for three years, the result of an empyema following pneumonia in 1923. Occasionally the discharge ceased for a day or two, but always returned. Three operations had been performed with the object of closing the sinus, but without success.

When referred to us the patient had a sinus at the level of the eighth rib. From this sinus there was a profuse discharge of foul-smelling pus. The patient's general condition was poor and his appearance "septic."

Examination of chest showed impaired percussion note with diminished voice conduction, and weak breath sounds over the base of left lung.

Treatment began on March 23, 1926. Twenty exposures were given to the mercury-vapor air-cooled lamp and the long flame carbon arc lamp. In addition, local treatment with the Kromayer lamp was given to the chest wall in the region of the sinus, the rays being conducted along the sinus by means of a fine quartz rod inserted therein. An intense local reaction was aimed at and produced. The discharge ceased after five treatments and the sinus healed rapidly. There was also definite improvement in the general condition. Treatment continued at intervals until May 25, 1926. A subsequent X-ray examination showed evidence of thickened pleura, but no fluid in chest.

The sinus is now closed and completely healed. There has been no discharge for over six months.

Abstracted from Sunlight, Dec. 11, 1926.

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Experiments on Activation of Cholesterol Derivatives and Allied Sterols by Ultra violet Irradiation, Alfred F. Hess

the part has been demonstrated, is valuable. This operation should never be performed before the ulcer has healed, as the wound might become infected from the ulcer.

SUMMARY

(1) Leg ulcer is a disagreeable and disabling condition.

(2) A study of the etiology reveals the following: That ulceration is caused by—

(a) Syphilis.
(b) Trauma.
(c) Sepsis.
(d) Phlegmasia albadolens.
(e) Varicosity.

(3) That trauma and infection are a valid influence in the poor.

(4) That the ulcers depend upon the character of the varicose veins and as such are divided into—

(a) Ulcers of the surface varix.

(b) Ulcers of the surface varix complicated by varicosity of the perforating veins.

(c) Ulcers of the surface varix of the postphlebitic type.

(5) It is necessary to differentiate between ulcer of the varix type, simple ecthyma, ulcerative syphilides, and tuberculous ulcers.

(6) A perusal of the methods of treatment shows such a variety that one is forced to the conclusion that no truly successful method has as yet been advanced.

(7) The most important principal in the management of chronic ulcerating surfaces is the stimulation of granlation and epithelial forming powers of their borders.

(8) This may be accomplished by the removal of inhibitory factors such as sepsis, defective circulation and inefficient general nutrition.

(9) (a) Ultraviolet ray has been found to directly kill pathogenic organisms on the surface of the ulcer.

(b) It stimulates the normal defensive power of the blood.

(c) It aids in the production of resorption and has a sedative action upon the cutaneous nerves.

(d) The effects of the air-cooled lamp are peripheral stimulation; increased circulation of the blood; increased nutrition; increased local metabolism; and phagocytosis.

(10) Applying these physiological facts to the treatment of ulcer, we have a method that adds materially to the comfort of the patient and the speed of the recovery. Combined with attention to prevent recurrences, it is probably the best method that has been offered.

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TREATMENT OF SCLERODERMA WITH ULTRAVIOLET RAYS

Ianichewski, Sofia. La Presse Medicale June 27, 1925, page 863.

Particulars are given of two cases of mixed scleroderma with marked nervous disturbances, which were successfully treated with ultraviolet irradiation over the thyroid gland. Local applications were also made in the principal areas of pigmentation. Nothing is said to indicate whether the effect was symptomatic or was deeper in its nature, reaching the cause of the affection.

PRINTED IN U.S.A.

The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy

Published by Alpine Press Inc.

VOL. 5, No. III MARCH 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

Copyright 1927
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth each month. One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., Newark, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
NIPPON HANOVIA SEKIEI-TO KABUSHIKI,
Kaisha, Tokyo, Japan
QUARTZLAMPEN GESELLSCHAFT, m. b. H.,
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NEWARK, N. J., MARCH 15, 1927

EFFECT OF ULTRAVIOLET IRRADIATIONS ON SOME GENERAL DISEASES INFLUENCING THE EAR, NOSE AND THROAT

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The different types of lupus of the ear and nose, although considered by many as intractable, now respond favorably to the newer types of artificial light treatments. This advance has been gaining momentum from the time of its first advocate, Finsen, and is well exemplified by the achievements of modern physicians, here and abroad, who unhesitatingly attest to the virtues of the ultraviolet ray and its more or less specific action on lupus lesions. The more resistant involvements which sometimes are not amenable to light therapy alone may respond quite well to other agents as the X-ray or surgical diathermy.

Tuberculosis of the mouth and fauces, and particularly the larynx, is met with by all laryngologists. The value of ultraviolet irradiations, both local and general, is now well recognized judging from the reports of able investigators in this special field.

TUBERCULOUS LARYNGITIS

Laryngeal tuberculosis occurs most frequently in the third and fourth decade of life and rarely in infancy and old age. The disease is practically always concurrent with pulmonary tuberculosis. Difficult and painful swallowing is a characteristic symptom, while dyspnea is not unlikely in extreme cases in which the infiltration leads to stenosis.

All cases of laryngeal tuberculosis should be treated even though a good prognosis cannot always be offered. Silence should not be regarded as the only treatment required, according to Mullin, for that alone is too depressing, though it should be rigidly enforced where the laryngeal condition is active. Mullin (3) agreed several years ago that heliotherapy in some cases seems to have an almost specific effect.

Voorsanger (4) in 1922 reported on seven cases of laryngeal tuberculosis treated by heliotherapy; two in which there had been complete arrest of the tuberculosis involvement, three others that improved and two that improved but left the sanitarium before a definite result could be obtained.

According to Mayer (5) the possibilities of affecting a laryngeal tuberculosis with artificial light sources are theoretically promising since it is possible to provoke chemical changes of tissues, focal reactions (as with tuberculin treatment), hyperemia, and even destruction of at least the most superficial of the bacteria. "The hyperemia may induce an analgesia in painful laryngitis."

Mayer emphasizes the imperative necessity of combining both general and local irradiations in all forms of tuberculosis to which light is applied.

The most striking extract from the literature contains a review of 133 patients with pulmonary disease treated at the Sikelborg sanitarium, Denmark; of twenty-two cases of tuberculosis of the larynx, six were healed, eight improved, five unchanged and three progressed. Radiations were general, with daily exposures of ten to sixty minutes, in most cases with the mercury quartz light and only in a few cases with the carbon arc. The conclusion was that light treatment was a favorable aid.

On the basis of a calcium deficit, Novak and Hollender suggested the use of general ultraviolet irradiations with the air cooled mercury quartz lamp. After the nasal symptoms subside or disappear, an increase in the calcium content of the blood will be noted by actual laboratory test, employing any of the accepted methods. It will be noted, too, that in practically all cases of true hyperesthetic rhinitis the relief is permanent, the quartz light augmenting the blood calcium and "fixing" it.

Further details of our own studies on this subject, particularly with reference to statistics, case reports and technic are purposely avoided because of the several reports already on record.

LUPUS

The advances which have been made lately in the treatment of lupus are indeed noteworthy; and the results achieved by some physicians with light therapy are encouraging examples of the effects of light as a remedial agent. Finsen proposed utilizing the sun or artificial light to irradiate the whole body. It was he who showed that erythema of the skin, produced by chemical light, remains months after the last irradiation, and that chemical light has a stimulating effect on the organism as a whole.

Reyn's belief that the carbon arc lamp yields results superior to those obtained with the mercury quartz lamp is not regarded with full favor by many. In this country the carbon arc is not extensively used, and favorable effects in lupus have been secured with the quartz burner. McKenzie and King (15) confirm this view in expressing their satisfaction with the results ganed from the use of the mercury vapor arc. They advocate a dose equivalent to the normal on sensitive skins, continuing with slowly increasing doses.

EFFECTS OF GENERAL LIGHT THERAPY

It is well established that ultraviolet rays act directly on the skin, in which they are absorbed. The efficiency of general irradiations is well illustrated in the case of a deep tubercular focus. When such a focus is healed by ultraviolet light, this is a function of the *indirect* action of light. "This indirect acton of light has been demonstrated by Jesoniek, who had all his lupus foci covered up and shielded from light by dressings, bandaged on during the whole time of treatment by general light baths. It was found in a few months' time that every one of these had healed." (Rothman.)

Rothman's researches have led him to believe that this action of light is transmitted to the interior of the body through the agency of the involuntary nervous system and that light baths, both natural and artificial, bring about a condition corresponding to sympathetic depression. (Sympathetico-hypotonia.) "Blood pressure and blood sugar are reduced, and sugar tolerance is lowered." Experiments by others have shown further, that enzyme action is not increased, that light radiation causes a further oxidation of the purine bases, particularly uric acid.

The therapeutic and physiologic effects of ultraviolet radiation while markedly interwoven must be somewhat differentiated. The primary skin reaction in terms of "erythema" are classified as first degree, second degree, third degree, fourth degree. The first degree erythema is necessarily very slight, the second is slight but attended by symptoms of mild sunburn. The third degree erythema gives correspondingly severe symptoms of sunburn, while the fourth degree actually produces intense symptoms and blistering of the parts which were exposed to the light.

While, as McKenzie and King state, erythema is a most interesting phenomenon, satisfactory therapeutic results may be produced in its absence. These same writers believe that there is some selection in the type of nerve ending affected, and that the pain-sensing nerves are those most easily stimulated. "But when the nerve endings have been submitted to larger doses than they can tolerate, cells will be destroyed, foreign products will form, inflammation processes will supervene, and erythema appear."

It is generally conceded that a gradual deep tanning is most desirable when administering general radiations for sys-

temic effect. This can be accomplished only by short exposures graduated to the tolerance of the skin without the production of vesication. Rothman remarks that in his work he avoids the slightest trace of dermatitis in general radiation. Very small doses and a very gradual increase of the time of exposure are the rule, until a good pigmentation is secured. "Dermatitis is never an advantage. On the contrary, it introduces into the treatment of tubercular patients an element of considerable danger, for in them the focal reactions after even a light dermatitis are quite unaccountable and often very serious."

Light energy influences metabolism in general. This is quite evident by its action on various organic substances of plant and animal origin; by its well-known action on skin and tissues; and by the increased respiratory and endogenous metabolism. The effect of solar radiation on the protein metabolism of rabbits was investigated by Pincussen and reported in 1924. A stimulation of the general metabolism as shown by an increase in introgenous excretion was noted by this worker, who showed also that sensitizers such as anilin dyes further augment the nitrogen excretion.

The ability of ultraviolet irradiation to effect calcium and phosphorous retention is now undisputed. Experimenters are agreed on this and the noteworthy work of Orr, Holt, Wilkins and Boone in conducting metabolism studies on infants with active rickets is a fine example of what research has accomplished along these lines.

Other effects are well known but are not now considered because they have been frequently discussed and the literature is replete with many interesting articles dealing with this subject. Suffice it to say in conclusion as is repeatedly mentioned by Ellis and Wells in their monograph, the field for ultraviolet therapy is daily expanding and it would be futile to attempt to survey it even in outline.

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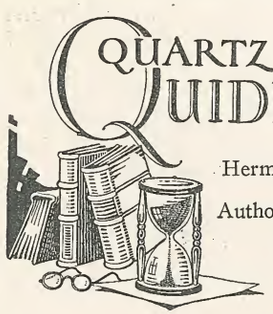
SIGNIFICANCE OF GENERAL LIGHT BATHS WITH THE QUARTZ LAMP IN THE TREATMENT OF TUBERCULAR LYMPHOMATA

In Tubercle, Bonsdorff states that in fourteen cases of gland tuberculosis which he treated by radiation with therapeutic lamps, a more or less complete reduction of the lymphomata was effected. When the glands had broken, fistulas and ulcers were healed. The general health of the patients improved and they gained in weight. Bonsdorff has come to the conclusion that in Finland, where sunlight is rare, general light baths with therapeutic lamps provide a good, if not a complete, substitute for the sun cure in the Alps and in sunnier countries, and are a valuable help in the treatment of tuberculosis.



QUARTZ LIGHT QUIDNUNC

By
Herman Goodman, M.D.
New York
Author of *Basis of Light In Therapy*

This column is conducted for the purpose of answering questions on Quartz Light Therapy. Readers are invited to submit such questions to the ALPINE PRESS, Inc., who will endeavor to have them answered by authorities on the subject.

Question: What is heliotherapy?
Answer: By its derivation, heliotherapy implies treatment with or by the rays as emitted from the sun.

Question: What is actinotherapy?
Answer: By its derivation, actinotherapy implies treatment with or by rays having a chemical action, and is usually limited to the violet and ultraviolet.

Question: What is phototherapy?
Answer: By its derivation, phototherapy implies treatment with or by light. By convention, light is limited to the visible zones of the spectrum, and the adjacent zones of the infra red, and the ultraviolet.

Question: What is the meaning of μμ?
Answer: μμ is a designation of millimicron, or one millionth of a millimeter. One μμ is equivalent to 10 Angstrom units. The Angstrom unit is one ten millionth of a millimeter. To transfer μμ to Angstrom units multiply by ten, as 370 μμ equals 3700 A. U.

Question: What is the relation between wave length and frequency.
Answer: The frequency is obtained by dividing the velocity per second (186,000 miles) by the wave length. Thus it is readily determined that wave length and frequency are inversely proportionate to each other. The greater the frequency, the shorter the wave length. It should be noted that in passing from wave lengths to frequencies and vice versa the velocity per second must be expressed in compatible units, thus if wave lengths are in A.U., 186,000 miles per second must be expressed in millimeters times ten million (300,000,000,000 x 10,000,000) i. e., A.U.

Question: Do X-rays and rays from radio active substances differ from ordinary light?
Answer: It is recognized that X-rays and radio active substances differ from ordinary light only in the fact that the wave length associated with them is very much shorter than for light in the visible zone, or ultraviolet zone.

Question: Is the violet ray of high frequency equivalent to the ultraviolet?
Answer: No. There is nothing in common between these sources.

Question: Is the mecury arc in quartz (either air cooled or water cooled) an emanator of ultraviolet exclusively?
Answer: No. These emanators radiate energy in the infra red, visible, and the ultraviolet. The especial feature of the emission is the extraordinary preponderance of ultraviolet, and particullarly the short ultraviolet.

Question: Has any recent work been done on the falling off of the ultraviolet component emission of the mercury vapor arc in quartz?

Answer: Yes. The scientists of the Bureau of Standards at Washington have investigated this feature. In their report they say:

. . . . In investigations made eight years ago, the lamps showed some deterioration with usage . . . since then marked improvements have been made in the construction of quartz mercury lamps, which no longer show the rapid discolora-

tion with usage previously noted. For example, the measurements . . . made on a quartz mercury arc burner that had been operated about 700 hours. The transmission through the shade B Noviol glass was 37.7 per cent. as compared with 37.8 per cent. observed in germicidal work two years earlier when the lamp was new, showing that within error of observation, there was no appreciable decrease in the ultraviolet component radiation relative to the total during the 700 hour usage. For if there had been an appreciable decrease in the ultraviolet emitted, then the recntly observed percentage transmission through the Noviol glass should have been larger instead of smaller than the previously determined value.

LEG ULCERS
THEIR TREATMENT BY ULTRAVIOLET RADIATION

By A. E. Schiller, M. D.

Ulcer of the leg, the bugaboo of the medical practitioner, stands at the top of the list of diseases causing disability and profound misery. A thorough study of this condition is warranted and any method that promises quicker relief than those current at the present time surely ought to be welcomed.

TREATMENT

A perusal of the various methods of treatment of chronic ulcers shows such a variety, that one is forced to the conclusion that no truly successful method has, as yet, been advanced. New methods are continually coming to the foreground, only to be relegated to oblivion and yet without experimentation and correlation of facts nothing can be accomplished.

The pathology of a chronic ulcer and an infected wound of long standing is very similar; the base is covered with exudate, the edges are elevated and covered with dead epithelium, the surrounding skin is thickened and there is a small cell infiltration surrounding the entire wound.

An important principle in the management of chronic ulcerating surfaces is the stimulation of granulation and of the epithelial forming powers of their borders. This is accomplished by the removal of inhibitory factors such as sepsis, defective circulation and inefficient general nutrition. For the production of these results numerous substances have been advocated and I will review some of the later day methods.

REVIEW OF METHODS OF TREATING LEG ULCERS

Hugo Hecht (5) advises the removal of the calloused circumference surgically, then the application of iodoform and dermol and later the application of epithelial stimulation as scarlet red, nitrate of silver, etc.

Faure-Beaubien and David (6) stated that ten of their patients with leg ulcers presented a definite hyperglycemia. While no sugar was detected in the urine, they were nevertheless trated with insulin; ten units being given subcutaneously twice daily. One case got 1,600 units, but the usual amount given was 500 units. Healing took place rapidly, although these cases stubbornly resisted other treatment.

L. Ambard, F. Schmidt and G. Levy (7) also presented patients with hyperglycemia, but no glycosuria and, in addition, added one case with normal findings and a leg ulcer. In all of these cases insulin was given with, apparently, good results and they raise the question whether insulin may not stimulate healing by modifying the nutrition in the tissues.

G. A. M. Van Gaalen (8) applied a hot air box to a leg ulcer of three years' standing, three to six hours a day, at 39 degrees centigrade. He obtained healing in twelve weeks.

If we are to determine upon a rational method of treatment of ulcers and infected wounds, we must endeavor to stimulate the normal defensive power of the blood, for in the blood are found the real defensive agents of the tissues, in the shape of phagocytes and alexins, which destroy bacteria and neutralize their poisons. Upon this theory rests the justification of the modern treatment of suppurative conditions by means of heat, passive hyperemia, etc., all of which, apparently, merely aid the natural functions of the body.

There is no question in my mind but that all agencies advanced in recent years to aid the body restore an ulcerated, or infected part to normal, the ultraviolet ray stands pre-eminent in ease of application, lack of pain, freedom from danger and in results obtained. Sidney Russ of Middlesex Hospital, London, says: "If a powerful source of ultraviolet radiation be directed upon an infected wound, the result of an adequate exposure will be that the pathogenic organisms on the surface will be directly killed. Cultural plates made show that bacterial cultures of all types, including the spores of tetanus bacillus upon radiation by ultraviolet light between 2,960 and 2,100 Angstrom units, were all promptly killed."

McCaskey, D.: (9) "Ultraviolet light acts as irritant to the skin. Vitality, therefore, of numerous cells is decidedly damaged and in order to take care of this damage there is a dilation of the blood vessels as a means of removing the dead and damaged cells. In other words, resorption takes place. There is also a sedative action upon the cutaneous nerves, tending to reduce nerve irritation, thus rendering the most painful ulcer practically painless in a comparatively short time.

Laboratory investigation has determined that radiation with the Kromayer lamp of from three to five minutes at approximately four inches is powerfully germicidal and bacterial cultures of all kinds which were radiated by this type of ultraviolet light were promptly killed, thus establishing the intense bactericidal action of the ray.

The air-cooled lamps emit the longer light waves, between 4,000 and 3,000 Angstrom units. These are more penetrating than the short rays. They are chemically oxidizing and stimulating to metabolism, while the shorter waves are more bactercidal. The air-cooled lamp is a builder. The effects are peripheral stimulation through nervous reflexes, increasing the circulation of the blood; increasing nutrition; and increasing local metabolism and phagocytosis. The results are due to increased elimination, relief from toxic conditions, increase in haemoglobin, and stimulation of the skin and its glands. It also has an unquestionable effect on the endocrine glands, and there is an increase in the ionic calcium and inorganic phosphorous content of the blood serum.

Based upon these factors, the treatment of ulcers by ultraviolet ray is logical and scientific.

METHOD

The method that I have used with the greatest amount of success is as follows: The ulcer is cleansed the day before by using a moist boric acid, or Dakin's solution. The edges of the wound are denuded of epithelium by brushing with gauze and curetting with a dermal curet. Mercurochrome has been found to carry the ray further into the tissue, so the wound is then painted with a 2 to 5 per cent. solution of mercurochrome. The Kromayer lamp, using either pressure, or a one-inch distance and from three to five minutes in time, is then used. At the same time the body, generally, is exposed to a therapeutic dose of air-cooled ultraviolet ray. Sterilization of the lesions and stimulation of granulation of tissue takes place, followed in a short time by regeneration of a smooth epithelium. A general rule that is good to remember is, that satisfactory results can be obtained by using an amount of ultraviolet ray that will cause inflammatory changes in the normal skin.

It is not sufficient to use only ultraviolet ray, because if we do this we forget some of the underlying causes. The leg should be dressed with gauze and tightly bandaged. After the ulcers have healed care should be taken to prevent recurrences. The wearing of silk elastic stockings, and excision of the vein, where inefficiency of the venous circulation of

of the Outdoor Life, February, 1927, p. 101-105.

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PRINTED IN U.S.A.

The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy *Published by Alpine Press Inc.*

VOL. 5, No. IV APRIL 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

Copyright 1927
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth each month. One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., Newark, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
NIPPON HANOVIA SEKIEI-TO KABUSHIKI,
Kaisha, Tokyo, Japan
QUARZLAMPEN GESELLSCHAFT, m. b. H.,
Hanau, a. M., Germany

NEWARK, N. J., APRIL 15, 1927

ULTRAVIOLET RADIATION
SOME ILLUUSTRATIVE CASES

A. Lisle Punch, M.B., M.R.C.P., Lond. and
Russell Wilkinson, M.V.O., M.R.C.S., Ent.

—Extracted from Sunlight, Dec. 1926.

CASE 3.—Male, aged 26. *Hodgkin's disease.* In January, 1924, patient complained of general weakness and loss of weight, and an enlarged gland was found in the left axilla and old shotty glands on both sides of neck. He went to Leysin under Dr. Rollier for the remainder of that winter. In July, 1924, some tender glands were observed on left side of neck. A white cell count showed a leucocytosis of 18,000 with 3 per cent. of eosinophils. Later, the white count increased to 20,300. No pyrexia. The following winter was again spent at Leysin, and on his return in June, 1925, a gland was removed which microscopically revealed changes typical of Hodgkin's disease. At this date another group of glands had arisen on the right side of neck. These visits to Leysin had benefited him very considerably. In November, 1925, it was decided that instead of going to Leysin, the patient should have a course of ultraviolet radiation.

At this time enlarged glands could be felt on right side of neck, axilla, both groins, and one in the right iliac fossa. Spleen and liver not felt. Mucous membranes pale. Patient complained of feeling "run down." Blood count was as follows: red cells, 4,400,000; white cells, 21,000; hæmoglobin, 81 per cent; colour-index, 0-9. Differential count (per cent.): polymorphs, 77-66; lymphocytes, 5-66; large mononuclears, 7-0; eosinophils, 9-0; basophils, 0-66; so that the picture was one of a slight degree of secondary anæmia with a considerable leucocytosis and marked eosinophilia. Treatment was begun on Nov. 20th, 1925. In all, 19 treatments were given with either the mercury-vapour air-cooled lamp or the carbon arc lamp, with exposures starting at five minutes and increasing up to 25 minutes at 36 inches distance.

Blood counts were done as follows:

Further blood counts	28-11-25	6-12-25	2-1-26
Red cells	4,400,000	4,500,000	4,640,000
White cells	13,000	14,640	10,430
Hæmoglobin	86%	91%	91%
Colour-index	0-97	1-0	1-0

Differential count (per cent.) on Jan. 2nd, 1926: polymorphs, 79-5; lymphocytes, 11-0; large mononuclears, 6-0; eosinophils, 2-5; basophils, 1-0.

Even allowing for the well-known fluctuations that occur in this disease, especially as regards the white cells, it would appear that there was an improvement in the blood condition during treatment. There was a definite rise in the hæmoglobin content, and an even more definite drop in the white cell count and in the percentage of eosinophils, so that the actual number of eosinophils circulating in the blood was very markedly decreased. During the treatment the enlarged glands diminished in size and no fresh enlargement of glands appeared. The temperature taken before and after each exposure showed no pyrexia throughout. The patient himself stated that he felt much benefited, and that the effect on his subjective symptoms was comparable with that experienced on his previous visits to Leysin.

The results in this case would suggest that the artificial, no less than the natural, sunlight has a therapeutic value in alleviating the symptoms and retarding the progress of Hodgkin's disease.

CASE 4.—Male, aged 27. A case of an obscure character which appeared to be an arteritis of some sort. He complained of pain and swelling in the toes and foot on the left side, and inabiliay to place the foot flat on the ground without discomfort, so that he walked on the outer side of the foot. On inspection the toes and foot were observed to be somewhat swollen, cold, and cyanosed. Movements of all joints full and free. Seven years previously a similar condition was present in the other leg, and the right calf now measured half an inch less than the left, owing to subsequent wasting of the muscles on the right side, Wassermann reaction was negative.

Treatment by ultraviolet radiation was begun on Jan. 25th, 1926, and consisted in general baths with the mercury-vapour air cooled lamp and carbon arc lamp, with local treatment to the foot with the former. Fourteen general and six local treatments were given over a period of four weeks, at the end of which time the coldness, swelling, and cyanosis of the foot had disappeared. The patient was able to put the foot flat on the ground without discomfort, and the pain which prior to treatment had been severe, especially first thing in the morning, was no longer present.

CASE 5.—Male, aged 36. Severe acne of chest, abdomen, and back of 20 years' standing. General baths with the mercury-vapour air-cooled lamp and carbon arc lamp were given, and after ten exposures the condition had almost completely cleared up with the exception of a few larger pustules, to which it was necessary to apply the Kromayer lamp with a quartz rod on two subsequent occasions.

CASE 6.—Severe acne of the face in a girl aged 16. General exposures were given as in the previous case, and local treatment was also given to the face with the tungsten arc lamp and the Kromayer lamp to individual pustules. For the first 10 or 15 treatments very little improvement was observed, but later this became definite, though slow. In all, 35 treatments were given, and at the end of this time the skin was clear and the scars of previous pustules scarcely noticeable.

Cases 5 and 6 were examples of severe degrees of acne. In our experience, ultraviolet radiation is of the greatest value in the treatment of this condition. There is considerable variation, however, in the readiness with which such cases respond to it. The first case was an example of a large group in which the response is almost immediate and in which the condition clears up very rapidly; the latter was an example of a smaller group in which the condition is refractory and requires prolonged treatment, but the results are ultimately good.

CASE 7.—Female, single, aged 32. Debilitated, pale, and listless. Bouts of indigestion of colonic type. Anorexia nervosa. Catamenia absent for ten months.

Treatment began March 26th, 1926. with general exposures, and was continued until 17 had been given up to May 3rd. On March 29th a scanty flow started, rusty in appearance, lasting four days. On April 5th a flow began lasting five days, and of a more normal appearance and quantity. On April 27th a six days' flow, practically normal. Treatment was suspended from May 3rd to May 17th, when three more exposures were given before the period was due. The period began on May 28th, lasted seven days, and was quite normal. There is no indigestion, appetite is normal and all subjective symptoms have disappeared.

This re-establishment of menstrual function, erratic at first but becoming normal in eight weeks after a complete cessation for ten months, seems to justify the treatment of functional abnormalities of ovarian or uterine activity by ultraviolet radiation.

We wish to record our indebtedness to Sir Thomas Horder and Mr. J. Alban Andrews for permission to publish accounts of those of the above cases which they sent to us for inclusion in this paper.

As a cerebal hæmorrhage of any but the smallest magnitude is a fatal condition, any method of attack which offers a prospect of relief is worth trial. The following brief preliminary note is of a procedure in apoplexy which I have not seen described.

MANAGEMENT AND TREATMENT OF MUCOUS COLITIS

By Louis Henry Levy, M.S., M.D.

PHYSICAL THERAPY

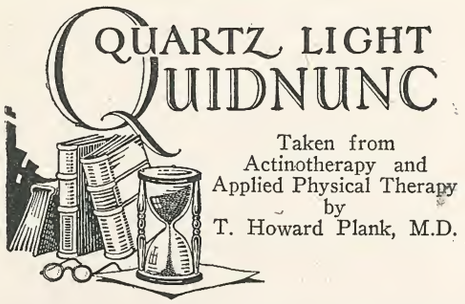
The treatment consists of the regular exposure to the air cooled mercury vapor lamp. The regular technique is employed, due consideration being given to the age of the patient, whether blond or brunette, and response to the action of the rays. The beginning treatment is based on these factors, and varies from three quarters of a minute to two minutes. The time is increased daily until the exposures, front and back, are of fifteen minute duration. It is desirable to expose as much of the body as possible. The distance of the lamp from the patient's body depends on the make of the lamp, the voltage employed, the type of the tube, and the age of the tube. These are individual factors and are easily ascertained by those familiar with the mercury vapor lamp. Two treatments weekly are given, the total number of treatments being from sixteen to twenty-four. When adhesions are present, it may be found necessary to add diathermy over the part involved, using the plates anteriorly and posteriorly with the regular diathermy technique.

By these means it is possible to obtain excellent results if not cures in as many as ninety per cent. of the cases. When it is considered that these cases are of a chronic type, this percentage seems unusually high. I believe there is no other type of chronic condition in which such a percentage of good results can be obtained. It might be stated in this connection that the most resistant of all cases are those that come for relief after operative measures have been used for some supposed surgical condition, which did not exist. As a rule some organ was removed or operated upon. Whether the formation trauma to the colon from the handling of the organ makes the condition more resistant to treatment is difficult to say, but these cases do not respond well to ultraviolet treatment alone. A combined treatment with diathermy, the radiant lamp, and the ultraviolet rays will occasionally help these.

To what may the good results be attributed? My experience in over one thousand cases of mucous colitis convinces me that there is an endocrine disturbance at the bottom of the condition. I am convinced of this, because this is a disease characteristic of the female sex—the sex most prone to disturbances of the internal secretions. Also, it is found among the class of society where neuroses prevail and at periods of life where gland disturbances are more apt to appear. Further, the action of the ultraviolet rays is primarily directed to the reestablishment of disturbed coorindation of the glands of internal secretion. That it accomplishes this in mucous colitis seems reasonable to assume, inasmuch as there is a total disappearance of all symptoms which would point to disturbed endocrine function, with a restoration to normal well-being of the affected patient.

Extracted from Physical Therapeutics, Feb. 1927.

Contribution to the Study of the Treatment of Tubercular Peritonitis with the Ultraviolet Rays. J. P. Chassigneux. These de Paris 1925. The author used the quartz lamp exclusively in periods never exceeding fifteen minutes, but bringing it as near as possible to the patient. Excellent results were obtained in the treatment of the ascitic form, without it becoming necessary in most cases to evacuate the fluid. In the caseous forms less satisfaction was met, since disappearance of the thickening occurred only exceptionally. Ultraviolet relieved suffering in the fibroadhesive form only in part, and is to be considered no better than an adjuvant to operation. After surgical intervention artificial heliotherapy restores the patient's strength, causes fistulae to disappear, and prevents relapse.



Question: What preparation should precede a light treatment?

Answer: Remove all clothing from the area to be treated. If the area is covered with crusts or discharges, they should be removed; dry sterile dressings are usually sufficient for?

Question: What are the dangers of destruction of normal tissues of the body with actinic rays from the carbon or quartz mercury-vapor lamps?

Answer: None, except the epidermis, if the time and distance specified are not exceeded.

Question: Is the epidermis destroyed?

Answer: Yes, just as it is destroyed by sunlight.

Question: What treatment is necessary for the inflamed or listered epidermis?

Answer: The 2,000-candlepower lamp, at 60 cm. distance, for twenty minutes or more, followed by the application of olive oil or petrolatum.

Questioin: How often should the treatments be repeated for chronic diseases?

Answer: Daily until improvement begins and then less frequently.

Question: How often should the treatments be repeated for acute diseases?

Answer: Daily.

Question: How long are the treatment?

Answer: This depends somewhat upon what one is trying to do. In some cases a thorough blistering is needed to produce results. From one to ten minute with the air-cooled or the water-cooled lamp for the eary treatments; the later ones may be continued for from ten to twenty minutes.

Question: What is the difference in time between treatments given with the air-cooled lamp and the water-cooled lamp?

Answer: Given at the same distance, there would be very little difference; but with the water-cooled lamp one can give the treatments in contact or under pressure, while with the air-cooled lamp one must keep the lamp at a distance of 20 or more centimeters to prevent heat burns.

Question: How can one keep account of the time during the treatments?

Answer: Use an interval-timer.

Question: Can all air-cooled actinic-ray lamps be used at the same distance from the patient and for the same length of time?

Answer: No, 110-volt lamps throw a smaller volume of actinic rays than the 220-volt lamps.

Question: Can all water-cooled actinic-ray lamps be used at the same distance and for the same length of time?

Answer: The answer is the same as for question No. 10.

Question: Is it necessary to protect the surrounding tissues for local treatments?

Answer: No, the tissues immediately surrounding the lesion should be rayed.

THE VALUE OF ARTIFICIAL HELIOTHERAPY IN PULMONARY TUBERCULOSIS

R. C. Kirkwood, M.D.

1. Clinical experience and scientific research prove that, used in suitable cases, artificial heliotherapy is of definite value in the treatment of plmonary tuberculosis, its use should be encouraged and its effects made the subject of our serious study.

2. The most outstanding of the favorable effects upon these pulmonary cases is the marked decrease in lung moisture.

3. Properly administered artificial heliotherapy does not produce or predis-

pose to hemorrhage, unfavorable psychic reaction or functional nervous disease.

4. Artificial heliotherapy can be used safely, usually to advantage, in any fibrous or nodose pulmonary lesion with little or no "activity" (febrile reaction, etc.), with little or no perifocal reaction (x ray) and not complicated by arteriosclerosis, hypertension or uncompensated cardiac disease (organic).

5. Artificial heliotherapy has distinct advantages over natural heliotherapy among which are that it is available in all localities regardless of climatic conditions at all seasons of the year, in all sorts of weather and can be used as advantageously at one time of day as another. Further, the dosage can be the more accurately measured and better controlled than is possible with natural heliotherapy.

6. And most important of all, to be of most value, to be safely and successfully used in the treatment of pulmonary tuberculosis artificial heliotherapy must be prescribed and supervised by a physician specially qualified by training and experience to assume this responsibility.

Extracted from Physical Therapy X-Ray and Radium, Vol VIII, No. 3, March 1927.

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to give a mild syndrome of allergic response or protein shock. It should not be inferred from this that light is innocuous, and that there are no contraindications. In general irradiations, positive harm may have been done those cases which are known to be light sensiitive, or to possess a physical allergy, and in those cases in which the metabolism is already overstimulated, as in pulmonary tuberculosis with secondary in fection, fever and toxemia and in certain cases of toxic goiter with high basal metabolic rate. These cases should be treated with greatest circumspection by ultraviolet light either natural or from the quartz mercury vapor lamp.

Final Summary—1. Quartz light is of great value in infections of the ear, nose and throat. 2. Both systemic and local treatments should be administered. 3. Other physical agencies of adjuvantal value such as diathermy and galvanism should be used when indicated. 4. Best results are obtained when teamwork exists between the otolaryngogogist and the physical therapist, each using the special methods which he has mastered and applying them in a common sense manner for the common good of all concerned, including, of course, the patient who has the disease, as well as the disease which is afflicting the patient.

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PRINTED IN U.S.A.

The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy *Published by Alpine Press Inc.*

VOL. 5, No. V MAY 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

Copyright 1927
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth of each month One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., Newark, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
NIPPON HANOVIA SEKIEI-TO KABUSHIKI,
Kaisha, Tokyo, Japan
QUARZLAMPEN GESELLSCHAFT, m. b. H.,
Hanau, a. M., Germany

NEWARK, N. J., MAY 15, 1927

ANTIRACHITIC PROPERTIES DEVELOPED IN HUMAN MILK BY IRRADIATING THE MOTHER

ALFRED F. HESS, M.D.
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and
ELIZABETH SHERMAN, B.A.
NEW YORK

Extracted from Jour A.M.A.
Jan 1, 1927—*Vol.* 88, *No.* 1

It has been firmly established that exposure to ultraviolet radiations, whether through the rays of the sun or artificial sources, regularly affords protection from rickets to animals and to human beings. The question arises whether similar protection can be transmitted through the milk by the mother to the young. It is an aspect that has both theoretical and practical significance. The subject of ultraviolet ray therapy is so recent that little investigative work has been carried out on ancillary aspects, and none whatever in regard to the reaction of the nursing woman to irradiation. Luce, who conducted a series of similar experiments with cow's milk, concluded that "the antirachitic value depends on the diet of the cow and possibly also on the degree of illumination to which she is exposed." The potency developed by the milk was not great. More recently Steenbock, Hart and their associates, tested the milk of two goats which had been irradiated with the mercury vapor lamp and reported a definite increase in antirachitic potency.

It is evident that the question of a transference of antirachitic properties to the milk is of importance in relation both to the etiology and to the prophylaxis of infantile rickets, for although this disorder occurs less frequently among infants that are nursed than among those few with cow's milk, nevertheless in our experience fully one third to one half of breast-fed infants develop rickets in this climate. It is highly desirable, therefore, to enhance the antirachitic properties of the milk of the mother. In order to elucidate this question, the milk of a woman was tested previous and subsequent to a period of artificial irradiation. The method of testing was the one that is established in titrating foods for their antirachitic content; namely, the feeding of the test substance in definite amount to young rats which are placed on a standard low phosphorous ration. Curative rather than prophylactic tests were employed in this instance, as it was inadvisable, for practical reasons, to have the feeding period extend to four weeks. After rœentgenograms had shown that rachitic lesions were present, a ration of 25 cc. daily of human milk was given in addition to the rickets-productive dietary. The milk was fed in this amount for a period of nine days, when the animals were once more roentgenographed, their blood analyzed for its content of inorganic phosphorous, and the bones prepared for microscopic examination. It was found that milk given in this amount absolutely failed to induce healing of the epiphyses, as evidenced either by the rœntgenologic or the microscopic picture. The inorganic phosphorous in the blood was exceedingly low, 1.98 mg. per hundred cubic centimeters, and quite significant of rickets.

The woman was then irradiated by means of the mercury vapor lamp. Irradiation was carried out every day, at the outset for four minutes, the length of time being gradually prolonged; the lamp was placed at a distance of 30 inches. It seemed that possibly a greater effect could be induced by placing the lamp farther away, so that after five treatments the distance was increased to 60 inches and the exposure prolonged to fifty-six minutes, conditions that rendered the intensity of irradiation approximately the same as at the outset. After irradiation had been carried out in this manner every other day for a period of one month, the milk was then again collected and fed daily to a series of rats in 25 cc. per capita amounts. As in the preliminary experiment, the animals had previously been rendered rachitic by a ration low in phosphorous. A striking difference was evident between the results from feeding milk that had been obtained previous or subsequent to irradiation; whereas no healing came about from giving the milk in the preliminary period, the result was quite the reverse during the second period—in every instance marked calcification of the epiphyses was evident. In several of these animals the bones were found so altered as to present almost a normal appearance. The inorganic phosphorous content of the pooled blood of the animals was 5.61 mg. per hundred cubic centimeters, as compared to 1.98 mg. in the previous series of rats. It was evident that marked antirachitic properties had been developed in the milk as the result of the irradiation of the woman.

This notable increase in the antirachitic activity of the milk was not due to an increase in its phosphorous content. Forbes gives the average phosphorous content of woman's milk as approximately 19 mg. per hundred cubic centimeters. We have found it to be 17.6 mg. in a sample of pooled woman's milk and 17.7 in the milk of a nursing woman in the hospital. Subsequent to irradiation, the milk of the woman that we had tested contained 16.8 mg. per hundred cubic centimeters; in other words, it was below rather than above the average in its percentage of phosphorous. Having ascertained that the antirachitic properties that had been developed in the milk through irradiation of the mother could not be attributed to an increase in its phosphorous content, a test was carried out to learn whether it resulted from an increase in the antirachitic factor. As is well known, the specific factor of cod liver oil, yolk of egg and other antirachitic substances has been found to be contained entirely in the nonsaponifiable fraction.

There is quite another aspect to this investigation; namely, the effect of these rays on the nutrition and health of the nursing mother. It has frequently been shown in studies of the mineral metabolism of lactating animals that there is a considerable loss of the salts, especially of calcium, in animals that are producing large quantities of milk. Meigs reported that during a large part of the lactating period the heavy milking cow usually suffers a loss of certain mineral elements from her body. Negative balances of calcium have been found to continue even though the ration contains an abundance of this element.

The yield of milk may be good in spite of a marked negative calcium balance. Although such experiments on lactating animals suggest an analogy to the nursing mother, it should be borne in mind that the physiologic conditions of lactation are quite different. The cow has about 25 liters of blood in its body, and secretes daily half this amount of milk or even more, whereas a woman who has approximately 7 liters of blood gives her baby every day approximately one seventh of this quantity. The ration of milk production to blood volume, and therefore the comparative drain of inorganic salts, is essentially different in the two species.

It has been found that ultraviolet irradiation brings about a marked alteration in the salt equilibrium of the lactating animal. Hart, Steenbock and Elvehjem have published experiments indicating that the rays from a mercury vapor lamp convert negative balances of calcium and phosphorus in the lactating goat to positive balances. Orr and his collaborators found that irradiation by a carbon arc lamp definitely reduced the loss of calcium of lactating goats. Henderson and McGee demonstrated by means of balance experiments that irradiation from this source brings about a marked increase in absorption of calcium and a moderate increase in absorption of phosphorus. Similar experiments in which sunlight was employed, instead of artificial light, did not lead to

such definite results; Hart, Steenbock and their colleagues, who conducted an experiment of this kind in June with direct sunlight, found that negative lime balances still persisted, and that "apparently summer sunlight in comparison with the radiations of a quartz mercury vapor lamp is feeble in its antirachitic properties when considered in relation to liberally milking animals." Doubtless such is the case; we estimate the intensity of the ultraviolet from the mercury vapor lamp to be at least thirty times as great as that of the solar rays. However, there is no doubt that sunlight is a most remarkable and valuable curative agent for rickets, so that once more a quantitative distinction may have to be drawn between effects on animal and man. Although sunlight may fail, investigators agree that the powerful ultraviolet radiations of the mercury vapor lamp are capable of balancing the mineral metabolism which has been adversely affected by the demands of lactation.

It would seem that our experiments have a definite application to both pediatrics and obstatrics, and perhaps to dentistry. They suggest the advisability of irradiating the mother during the lactation period as a means of protecting her child from rickets and of maintaining her own nutrition, especially the integlity of tissues which form the storehouses of calcium and phosphorus—the bones and the teeth. How effective this method will prove must be ascertained by clinical experience. It may be added that less intense irradiation probably would have sufficed to bring about protective qualities in the mother's milk. It would be interesting to ascertain whether irradiation during the last weeks of pregnancy will not likewise increase the antirachitic factor in the milk. The nursing woman might well be given the benefit of a therapeutic measure of this kind, in the home, in the lying-in hospital and in the baby welfare clinic.

SUMMARY

Uultravoilet irradiation of a nursing woman brought about a marked increase in the antirachitic potency of her milk. Fractionalization of the milk showed that this effect was due to an augmentation in the antirachitic (nonsaponifiable) factor. It is suggested that such irradiation be employed in order to protect infants from rickets and nursing mothers from excessive drain of calcium and phosphorus.

THE INDIVIDUALITY OF CHOLESTEROL

—Extracted from Jour. A. M. A., April 9, 1927

The circulating blood contains cholesterol esters in the plasma, while the alcohol itself is represented in the red corpuscles. Here it is assumed to protect the erythrocytes against the action of hemolytic substances which, unless counteracted, might tend to cause anemia through excessive hemolysis. Cholesterol is believed to be concerned in various immunologic reactions, though its functions therein cannot at present be clearly defined. Sherman points out that as a constituent of waxes and the sebum of the skin it protects the derman structures; it, or its degradation products, aids the other lipins in giving to cells theiir power of holding large quantities of water without dissolving or losing their peculiar semifluid characters. The newest interest in cholesterol arises from the discovery, made independently by Hess and Steenbock in 1924, that cholesterol, under the influence of ultraviolet rays (from direct sunlight or artificial sourses such as the mercury vapor quartz lamp), may be so changed as to acquire the property of "antirachitic vitamin." Consequently, the presence of cholesterol in the skin also acquires a new and greatly enhanced significance from the discovery that it may be changed by irradiation into an important vitamin.

ULTRA VIOLET RAYS IN ASTHMA

P. Dunhem, M. D., Paris Med., Feb. 20, 1926.

P. Duhem, M. D., reports the treatment of 33 cases of infantile asthma with ultraviolet rays during the last year and a half. Complete cure resulted in 17 cases which had previously appeared to be hopeless, 6 were markedly improved, 4 were definitely benefited, in 4 cases no change was produced, and in 2 cases the treatment had to be terminated prematurely owing to return symptoms. Duhem considers that the treatment should not be prolonged or intensive and that intervals without treatment should be nterspersed. He starts with an exposure of two minutes, the quartz lamp being placed at a distance of 60 cm. and increases the subsequent exposures by two minutes up to a final total of six minutes. The lamp is brought nearer by 5 cm. at each exposure until a distance of 45 cm. is reached. Duhem draws attention to the production of ozone by the quartz lamp with irritant effects on the bronchi and the lungs. He therefore emphasizes the need of caution in treating asthma in this way.

LIGHT AND HEALTH

By

CHARLES H. MAYO, M. D.

Extracted from Jour. of The Franklin Institute Jan. 1927, *Vol.* 203, *No.* 1

It is but lately that we have appreciated radiant energy although it was only about two hundred and fifty years ago that the sunlight was first broken by Sir Isaac Newton's prisms into its bands of light from violet to red. The visible rays represent but a fraction of the spectrum. Now we know that the heat waves lie in the red and intra-red regions and next come the radio waves which are many metres long and then the alternating electric current with some waves many kilometres long. At the other end of the visible spectrum is violet, and beyond the visible violet comes ultra-violet, then radium rays and X-ray with still shorter waves. The waves of the visible spectrum are measured by the millionth of millimetre length and run from about 400 to 800 millicrons (violet to red, through the blue, green and yellow), or by the Angstrom units (a ten-millionth of a millimetre) from approximately 4000 to 8000. Certain wave-lengths of ultra-violet rays are most important in stimulating the chlorophyl (which is the green of plant life), the hemoglobin of blood-cells (which, in thin layers, are also green), and the photosensitive plate. The ultra-violet is the most stimulating and is held by the tissues of the skin while shorter and longes waves at both ends of radiant energy pass through or are absorbed by the body. Thus red glass holds back all but the red waves of the light or visible spectrum and passes a considerable quantity of heat waves. Uutra-violet causes the cells of the skin to protect their nuclei rapidly by screening with melanin, or the so-called tan of sunburn. Such rays lower blood-pressure from 7 to 10 percent., somewhat increase the oxygen of the blood and blood calcium, the activity of endocrine glands and the storage of iodine by the thyroid. This is of great importance as the blood carries the same fourteen primary elements that good soils does for plant life. The ultra-violet increases vitamin A; in fact can develop it in linseed oil exposed to the ray. Cod-liver oil has a large amount of this vitamin. Thus the violet ray of the sun prevents and cures rickets, which is so prevalent among the children of Scotland with its fogs and clouds and smoky air, as it is approximately only for one-half year that they have much chance with old Doctor Sunshine.

Fortunately man's ingenuity has developed the qquartz glass (or fused quartz) which permits the ultra-violet ray to pass. Celluloid and paraffined gauze are also somewhat permeable to it while common window-glass cuts out most of it. Thus the mercury-vapor quartz-lamp, or arc light with carbons combined with nickel emits a large amount of ultra-violet which can be used in the treatment of chronic diseases, especially tuberculosis of the lungs and joints. The greatest effect of ultra-violet from sunlight is obtained at midday as the rays pass through the thinnest layer of air over the earth. The long slanting rays of morning and afternoon are largely screened by the air, especially because of the average half-inch layer of water diffused in hydroscopic form throughout the air. Thus high mountain altitudes are used in order that such sun treatments shall be most effective, although ultra-violet treatments are of value for shorter periods in any place,and arti-

ficial ultra-violet light can be created where nature gives little or no aid with sunlight. The ultra-violet which can be transmitted through air covers one and one-half octaves of light radiation, and one of the most destructive bactericidal regions of ultra-violet light is just below the very limit of the solar spectrum, that is 2800 to 2900 Angströms. The ultra-violet stimmulates chemical reactions without heat, which would otherwise require great heat to accomplish.

QUARTZ LIGHT THERAPY IN EAR, NOSE AND THROAT CONDITIONS

Edwin N. Kime, M. D.
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Extracted from Jour. Indiana State Med. Ass. March, 1927

It is not then entirely without reason, that otolarynogologists who keep apace with modern medicine in other fields of work, and who have noticed for years the cyclic phases of infectious concurrent with the changes of seasons, should have become interested in helio and actinotherapy. Lingeman's conclusions, based upon his own observations and as obtained from a questionnaire of other otolaryngologists who have had experenice with this work, are that ultraviolet light has real virtue and deserves recognition as a therapeutic agent in this field, but that its chief value is as an adjunct agency, and that its indications should be thoroughly understood, and the technique mastered and properly controlled. Although not a user of the air-cooled lamp, he recognizes as do most of those who answered the questionnaire, its importance in this work.

With these conclusions, the essayist is in entire accord and particularly those in which quartz light is stated never to be the whole treatment, always to be considered as an important adjuvant, and to be best administered both locally via the water-cooled quartz mercury lamp and also generally to the entire body via a suitable air-cooled generator. The otologist who does not care to devote the necessary time and trouble to master the many details concerning the indications and technic of this work, and then apply them to his patient conscientiously, will not logically be expected to succeed in this, any greater than he would in any other line of therapy so "lightly" considered. On the other hand the general medical man, or internist, or physical therapist, who attempts to treat patients with nose and throat symptoms without making a careful examination or consultation with a competent otolaryngologist, makes an even greater mistake since he is working blindly, and will likely overlook a mechanical or pyogenic condition which if not relieved will never permit complete restoration of function or even complete symptomatic relief.

The essayist is of the opinion that much more can be accomplished by intelligent teamwork between the internist and physical therapist on the one side, and the otolaryngologist on the other, than by either working alone. The former ordinarily should not be expected to be as skilled in exact diagnosis of eye, ear and nose conditions, nor to remedy them by surgery if it is needed. On the other hand, the busy specialist will seldom take the necessary time and trouble to administer to each patient the quantity and variety of the physical agencies necessary to successfully handle the indications. In the use of light, both water-cooled or bactericidal light, and air-cooled or biological actinotherapy should be administered to each patient. Often these are best preceded by some form of heat, either by an ordinary incandescent light, or preferably by diathermy. These treatments should, all told, never total less than an hour, and oftentimes longer. In my practice a competent otolaryngologist sees every case, or refers it to me with a correct diagnosis. Proper nasal treatment, for shrinkage of congested mucosa, and subsequent æration for drainage purposes precedes each physio-therapeutic seance. Necessary surgery is first performed if in the judgment of the otolaryngologist this be deemed advisable. In the pyogenic affections of the nose and ear, the same principle of treatment applies as anywhere else in the body, and the first

principle is, of course, drainage. The next principle is stimulation of the tissue resistance, both locally and by increasing the vis medicatrix naturæ. The end result is hyperemia, mobilization of phagocytes and bactericidal agencies, and these are all obtained by both the water-cooled quartz light and by diathermy. The chief difference is the length of time required to produce these effects. Diathermy produces them immediately to whatever extent the increased perfusion of blood through the local area will permit. In addition to a similar hyperemia which develops after several hours latent period and which remains for days, the water-cooled has a direct bactericidal power of still undetermined value. It will destroy any bacterium with which it comes into contact but its penetrating power is almost nil, not greater than the diameter of an influenza bacilus, according to the noted authority on light, Leonard Hill. Hence, from the practical standpoint, it is wise to remove all surface exudates, incrustations, fibrin, etc., and probably also of value to avail ourselves of the synergistic properties of the photosensitive dyes such as mercurochrome and gentian violet. Kober et al, has presented evidence to show that the aminoacids of which human protein is composed contain very little tyrosin and phenlalanin, whereas bacterial protein and zein are rich in both. Now it so happens that both these aminoacids are much more capable of absorbing ultraviolet light than any of the others. On this basis he explains the selective affinity for light evidenced in pellagrins, and the postulated benign paradox of selective destructive power for bacteria. These observations are of great interest, but remain yet to be verified by other observers. We can state, however, that light as a germicidal agency, seems to be even more efficient in vivo than in vitro.

A few practical points in the technic of water-cooled lamp therapy may be of interest to those men doing this work. Since the light is very superficial in action, and since that which does penetrate beneath the epithelium is absorbed and carried away by the blood in the superficial capillaries, deeper levels in the subcutaneous tissues can be reached by pressure with the quartz lens. This dehematizes the skin and more prompt results are obtained. I have particularly found this of value in the treatment of nasal and aural furuncle, and in the preauricular lymphadenopathy secondary to suppurative otitis externa. Heavy radiation must be used, sufficient to produce a regenerative erythema, or "peeling" of superficial epithelium. Most beginners in quartz light therapy err more by undertreatment than in overtreatment. It is hard to give an overdose with ultraviolet, particularly in the nose or on the skin of ordinarily exposed surfaces. A word of caution, however, as to the throat. The mucosa over the soft palate is extremely sensitive to quartz light, and should never be radiated longer than two or three minutes with the more powerful burners, unless a severe vesicular reactive lesion is desired. This relationship of sensibility to light between the nose and throat is the reverse of what is to be expected by the experience we have all had with the use of chemicals in these two cavities. We would naturally expect the nose to be much the more sensitive to light, but such is not the case. Roughly, I should say it is at least a third less sensitive than the throat. The reasons for this are hard to find, but possibly it is because the opaque nasal mucus is more tenacious and offers better protection than the transparent salivary coating of the oropharynx and soft palate. At any rate, heavy focallized radiation as from the end of a quartz rod or from the open lamp when directed to an area a centimeter or two in diameter is usually far more efficient than a widespread radiation of very short duration. It is my practice to use both in the abortion or early resolution of acessible pyogenic affections. I have never seen permanent scarring or serious constitutional symptoms from even very heavy focallized radiation. Neither have I seen scar formations follow heavy radiation over wide areas, but the absorption of destroyed skin protein is often sufficient

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PRINTED IN U.S.A.

The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy *Published by Alpine Press Inc.*

VOL. 5, No. VI JUNE 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

Copyright 1927
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth of each month One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., Newark, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
NIPPON HANOVIA SEKIEI-TO KABUSHIKI,
Kaisha, Tokyo, Japan
QUARZLAMPEN GESELLSCHAFT, m. b. H.,
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NEWARK, N. J., JUNE 15, 1927

LIGHT TREATMENT IN SURGICAL TUBERCULOSIS

By

SIR HENRY GAUVAIN, M.D., M.CH. CAMB.

Extracted from The Lancet, April, 9, 1927

This paper is based on experience in sun and artificial light treatment in surgical tuberculosis at the Treloar Cripples' Hospitals at Alton and Hayling Island. The remarks which follow should be taken as restricted to the general light treatment of surgical tuberculosis, and not necessarily as referring to other conditions to which phototherapy might be applied.

It is important to inquire why the results of light treatment in surgical tuberculosis are so variable, why, in some instances so brilliant, and in others so disappointing. If we could explain these differences we should be in a better position to conduct treatment with promise of success. I, therefore, would place before you a theory which attempts to explain these variations. For want of a better term I shall call it the "theory of varying stimuli and varying response." It may, at any rate, form a working hypothesis as a guide to treatment.

Sunlight not a Specific Treatment

Contrary to what has been stated elsewhere, the sun will not cure all forms of surgical tuberculosis. In my opinion it is in no sense a specific treatment. At the best it is usually an aid to, and an accelerator of, cure, and only to a limited degree should it be used as a substitute for other means of treatment. Its employment should supplement not supplant other means of cure. Nevertheless, as an aid it is often of unique value. Treatment by light may be general or local, or both, and the source of light may be solar, from artificial sources, or a combination of both. By the majority general treatment by natural sunlight is considered the best form of light treatment available. I hold the view that the best type of general light treatment to adopt will depend on the nature of response of the individual concerned.

Here let us first briefly consider where sun treatment fails. If, as alleged, the sun will cure all forms of surgical tuberculosis, why is it that it not only will not prevent infection, but also will not cure the disease in subjects living in the most sunny districts? It is well known that tuberculosis will readily infect and rapidly slay unimmunised native races living under apparently the most ideal conditions from a heliotherapeutic standpoint. Islanders residing near the equator, enjoying an equable climate, where the native may live nude all the year round, exposed to and enjoying sunlight of high actinic value, may rapidly die from the disease. It may be argued that the hygenic conditions are bad, and that they have not acquired immunity. But relatively immune resident Europeans becoming infected and who live hygenic lives will not necessarily or even probably be cured under these conditions, so apparently perfect for heliotherapy. They will almost certainly do better if they return home. I am not now alluding to localities such as central or southern India, where the excessive heat renders sun treatment of only very limited application. Were light a specific treatment for tuberculosis, we might reasonably expect that the onset and progress of the disease might be prevented under suitable heliotherapeutic conditions. This is contrary to fact.

Consider the much-lauded Alpine climate. Tuberculosis is endemic in Switzerland. It has even been found desirable to establish a special sanitorium for university students. Tuberculosis will arise and develop in sun-cure stations in the Alps. More than that, it may even progress to a fatal termination in a person resident at such a station who has there

acquired the disease and has had heliotherapeutic treatment *ab initio*. Bernhard, though extolling the value of the high mountain sun, quotes Sauerbruch, who draws attention to (what Bernhard calls)

Pigmentation

I should here make brief reference to the role of pigmentation of the skin following sun treatment. Its value has been denied, but shrewd clinical observers like Rollier testify to its ultility. With them I agree. It is valuable because it has a protective function. Longer exposure to light and cold can be tolerated and, if such exposure is correctly timed, is advantageous. Pigmentation is not necessarily synchronous with amelioration of disease, though it frequently is so. A pigmented patient may be so severely infected that nothing will save him, but that is not the fault of his pigment. Moreover, when a patient is well pigmented, erythema, one of our useful aids to dosage, is lost and an unskilled practitioner may make errors in exposure, but that is the fault of the physician. As a general rule, a well-pigmented subject can tolerate and benefit by longer exposures to light and cold air than a non-pigmenter, and the danger of error is diminished.

A NOTE ON DOSAGE IN PHOTOTHERAPY

By

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(From the National Institute for Medical Research)

Extracted from the Lancet, September, 25, 1926

Experiments carried out recently indicate that the normal skin is sensitive to sources of light which emit ultra-violet rays shorter than 3100 A.U. The skin exposed to any such source of light responds after a latent period of time by an erythema, on which may follow desquamation and pigmentation. It has been shown that the degree of erythema produced depends upon: (1) the distance of the skin from the source of light; (2) the temperature of the skin; (3) the kilowatt energy of the source of light and intensity of ultra-violet rays shorter than 3100 A.U. emitted; (4) the individual sensitiveness of the skin to light.

From a series of observations on the effects of "ultra-violet radiation" of the skin, it was shown that doses of light which produced erythema increase the non-specific bactericidal power of the whole blood for a period varying from ¼ hours after the exposure to light. There is some evidence of a preliminary stage of depression of the haemobactericidal power half an hour after exposure. The following table gives an indication of the results obtained:—

From observations on about 180 consecutive patients who were undergoing light treatment, it was shown that the exposure of the skin of the chest and back to the mercury-vapour lamp or arc, which subsequently resulted in erythema, often increased the bactericidal power of the blood. An attempt was made to determine the minimal erythema dose of light by previously testing the sensitiveness of the skin. In all these cases, and also in the animal experiments, the total surface area of skin irradiated was chosen in an arbitrary manner. It has been shown that excessive exposure of the skin to light is a harmful procedure. Colebrook found that such exposures may diminish the bactericidal power of the blood. But in all these observations stress has been placed upon the ultra-violet or light dosage and not on the area of skin exposed. The experiments described in this paper have been carried out to determine the importance in phototherapy of the surface area of skin irradiated.

General Procedure

The skin of a number of rabbits was exposed to the mercury-vapour lamp (M.V.L.) and the bactericidal power of the blood was determined before and after irradiation. The animals were all carefully weighed before the experiment, and the surface area of skin which was exposed to the source of light was controlled and measured. At each experiment the dosage of light was estimated by measuring the intensity of ultra-violet rays emitted according to the lethal action

on infusoria. By these means it was possible to calculate the smallest area of skin per kilogramme of weight of the animal, which after exposure to the M.V.L. produced a definite increase in the bactericidal power of the blood. By carrying out a similar series of experiments the importance of the surface area of skin exposed to dosage—i.e., length of time of exposure—was observed.

A Typical Experiment

The abdomen of six rabbits was shaved by means of soap and a razor. The animals were carefully weighed. A sterile blood specimen was collected from each animal (by bleeding from the left ear vein), and the blood was defibrinated with a sterile glass rod. The animals each in turn were fastened and irradiated after being covered by a large piece of cardboard having a central perforation in it corresponding to the surface area of skin chosen for irradiation. The source of ultra-violet rays was either a water-cooled M.V.L. (2.5 amps.+200 volts), applied locally to the skin, or a M.V.L. (2.5 amps.+110 volts between electrodes), 8 in. distance from the skin. The lethal time for infusoria, or I.K. units, under these conditions was 3 minutes, so each 3 minutes' exposure corresponded to one I.K. unit. The following plan of procedure was adopted in this experiment.

A second sterile blood specimen was collected two hours after the irradiation of the skin and was defibrinated as before. The bactericidal power of each sample of blood collected was determined by the method described by A. E. Wright, L. Colebrook, and E. J. Storer.

Conclusions.—1. A definite erythema was seen over all the skin areas irradiated, and a marked oedema of the skin of rabbits Nos. 19, 22, and 23 was seen the following day. These three animals later showed desquamation, and a scab formed at the site irradiated. 2. In animal No. 19 the small skin area irradiated did not produce a decided increase in the bactericidal power, in spite of the massive dosage.

Conclusions from Experiments

From this series of experiments the following observations have been recorded:—

1. An "erythema" dose of light is necessary to obtain an increase in the bactericidal power of the blood after radiation of the skin.

2. In all the experiments in which the minimal erythema dose of light was employed—i.e., 2 I.K. units: (*a*) The smallest areas of skin from 1-5 sq. cm. per kg. of weight were subminimal and failed to give a "bactericidal" response. (*b*) Areas of skin from 5-10 sq. cm. were the minimal area which had to be irradiated to show a definite increase in the batericidal power of the blood. (*c*) Areas of skin from 15-20 sq. cm. per kg. showed a more decided improvement in the bactericidal power of the blood after irradiation. (*d*) The areas of the skin from 20-50 sq. cm. per kilogm. wt. showed the optional response. (*e*) Areas of skin over and above 50-100 sq. cm. per kilogm. wt. of the animal did not give any bactericidal response and appear to be too large a surface area irradiated.

3. When the length of time of exposure is increased so as to produce a greater degree of erythema and oedema of the skin: (*a*) On the whole, provided an erythema dose was maintained, no very striking changes other than those already mentioned was observed. (*b*) The subminimal areas exposed showed no change. (*c*) A slight improvement was seen in the minimal areas—i.e., 5-10 and 10-20 sq. cm. per kilogm. wt. (*d*) No rise was seen in the experiments in which large area and intense dosage were employed. In some cases a decided fall in the bactericidal power was recorded.

4. There therefore appear to be two great factors which control the bactericidal response of the blood to irradiation of the skin: (*a*) The surface area of skin irradiated per kilogm. wt. of the animal. (*b*) The intensity of the erythema produced—i.e., the length of time of exposure, &c.

In all these experiments the surface area of skin irradiated per kilogm. wt. of the animal appeared to be *the more important factor than the time of exposure or the intensity of ultra-violet rays; provided the erythema dose was maintained.* Some observers maintain that the biological action of light is in part due to the production of a photo-chemical substance, derived from either the tissue cells or the bloodcells, but no definite experimental proof supports this view. It is conceivable that an excess of such a substance would inhibit the efficiency of the leucocytes. In many cases of severe sunburn, and also with burns caused from heat and other causes, the surface area of skin irradiated plays an important role in the sequelae which may follow. It is possible to produce "sunstroke" by irradiating the head with an intense focused beam of visible light, but this effect is due to the penetration to, and the heat effect on, the brain of the visible rays. Conversely, it is difficult to seriously damage small animals which have been made "light sensitive" by means of eosin or haematoporpyhrin unless a large area of skin is exposed to the source of light.

It is of interest to correlate the surface area of skin exposed per kilogm. wt. of the animal to that of the human body. In the case of a person weighing 10 st. this roughly gives the following results:—

The subminimal area would therefore be 56 sq. in., the optimum area from 280 to 560 sq. in., and the maximal optimal area over 896 sq. in.

Since these experiments have been carried out, the effect of radiation of the skin on the bactericidal power of the blood has been investigated in over 30 patients who were having light treatment. In all these cases the skin of the back extending to the level of the last rib (or ½ in. below) was exposed to the M.V. or to the arc lamp. In the great majority of cases an increase in the killing power of the blood was observed with a minimal erythema dose of light. These results compared favourably to those obtained previously when the skin of the chest and back was irradiated. It is beyond the scope of practical clinical methods *to carefully weight patients* and measure areas of skin; but exposure of small areas of skin, such as the back or chest, have shown good results. In the present method of treatment the skin of the body is roughly divided into four areas: (1) the back, (2) the chest, (3) the front of the legs, (4) the back of the legs. One of each of the areas is exposed to the source of light every alternate day. The dose of light employed is always the minimal erythema dose. The aim of each treatment consists in the production of a mild erythema which disappears within 48 hours and may be followed by desquamation. The patient has three treatments per week, so that an interval of rest of at least nine to ten days elapses between the exposure of any one of the four areas of skin. This interval of time allows for the skin to completely recover from the previous dose of light. In this way the skin will be found to remain sensitive and react to small doses of light, and an erytehma can be usually maintained with ⅔ I.K. units. As a usual routine treatment is started with the mercury-vapour lamp. With the onset of a slight perceptible pigmentation (this is often seen after the second exposure of each area) the dosage with the M.V.L. is increased, or treatment is started with the arc lamp. In those cases where failure to develop a definite erythema occurs, the dose of light is repeated over the same area of skin and increased. In no case is any area of skin irradiated which shows signs of desquamation; the skin is always rested until it appears to be normal. By means of this technique the area of skin exposed to the source of light is proportional to the body-weight of the patient. Rollier and Gauvain adopt a technique in treatment by heliotherapy, by which the body is gradually exposed to the sun and sky until the whole surface area of skin is irradiated. At the Light Institute at Copenhagen and at many other places the whole body is exposed to the source of light according to a routine schedule. No importance is attached to the biological response of the skin after radiation. The exposure to light is systematically

carried out until patients are exposed for two hours. By the technique which has been described, during the whole course of treatment exposure to the source of light is controlled by the erythema reaction of the skin. The object of each treatment is to produce a minimal erythema over an area of skin considerably less than one-quarter of the surface area of the body. A great advantage of this technique is that the length of time of exposure is considerably shortened. Any type of lamp which readily emits erythema-producing rays is suitable. With the M.V.L. and arc lamps which were employed in these observations treatment started by exposures from 2½-5 minutes (1½-2 I. K.), and even after 30-40 treatments an erythema could be easily obtained by exposure of an area of skin for 10 minutes (4-8 I.K.). By resting each area of skin for 10-14 days between each exposure the skin is continually maintained in a light sensitive state.

THE PHYSIOLOGICAL ACTION OF LIGHT

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Extracted from Physical Therapy, X-Ray and Radium, Vol. VIII, March, 1927, *No.* 3

It is the purpose of this paper to discuss certain results, some of which have already been published (1), which, it is hoped, may add something to our small store of accurate scientific information on this subject. It is not necessary here to go into detail concerning the various considerations which lead to the undertaking of this study nor to describe the preliminary experiments.

Dogs under ether anaesthesia have been used almost exclusively. After all routine operative technique was completed, including attachment of a manometer for blood pressure measurement and preparation of the femoral artery for withdrawal of samples of blood, a small quartz tube was inserted in the carotid artery so that the blood flowed through this. Neighboring tissues were protected with thick cotton pads soaked in Ringer solution. In some experiments it was possible to carry on these procedures without clotting in the tube, but in most cases it was necessary to protect against this by means of an intravenous injection of heparin, an organic anticoagulant. So far as can be determined at present this substance has no influence on subsequent reactions *except* prevention of clotting.

After a constant level of anaesthesia was produced the beam from the lamp was projected on the blood flowing through the tube. In all cases a control series was run in which the animals were subjected to all technic *except* irradiation and allowed to lie under anaesthsia for periods comparable to those in the experimental series so that it can be fairly stated that the results obtained were *not due to ether* anaesthesia.

Most of the results reported conform fairly well with those reported by others in clinical experience or in other types of experiments. It is believed, however, that these results add still further support to the idea which seems to be now accepted by many investigators that photobiologic effects in higher forms are mediated through the blood.

There are, however, three theories as to how systemic effects are produced by irradiation. In one of these, already mentioned in a paper previously presented by a colleague, it is held that the effects are produced by stimulation of nerve endings in the skin, resulting finally in general stimulation of the autonomic nervous system.

Another theory holds that the rays liberate some substance from superficial cells that acts as a hormone.

The third theory, already mentioned, assumes that rays penetrate to the blood stream and induce changes therein that effect general systemic reactions.

It would not be possible or profitable to attempt to marshal all the evidence in detail that has been advanced in support of these ideas.

Suffice it to say at present that there is no direct neurologic evidence in support of the nervous theory. Furthermore, I have performed numerous experiments in which a depression in blood pressure has been produced by irradiation of the eye in etherized dogs. At first I believed this to be purely a reflex result. However, repetition of the experiments with both vagi and the optic nerves cut in both eyes resulted in similar effects. There was some modification believed to be due to trauma induced by the operation necessary in cutting the optic nerve since these same modifications occurred in control animals. However, the possibility of a minor nervous influence is not entirely ruled out. But the main effect must be assumed for the present to be due to irradiation of blood in the rich retinal capillary bed.

Irradiation of the capillary bed in the pharynx produced the same result. Other investigators have obtained similar results in other regions such as the vagina.

The main support for the nervous theory is found in the results of experiments on penetrating power of rays in dead human skin. In this connection, however, attention is called to the fact that the penetrating power in living and dead protoplasm is quite different. Macht has found, by inserting a spectroscope beneath the skin of a live dog, that penetration *is* sufficient to reach capillaries and even larger vessels in and under the skin.

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PRINTED IN U.S.A.

The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy *Published by Alpine Press Inc.*

VOL. 5, No. VII JULY 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

Copyright 1927
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth each month. One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., Newark, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
NIPPON HANOVIA SEKIEI-TO KABUSHIKI,
Kaisha, Tokyo, Japan
QUARZLAMPEN GESELLSCHAFT, m. b. H.,
Hanau, a. M., Germany

NEWARK, N. J., JULY 15, 1927

INFLUENCE OF FILTERED QUARTZ LIGHT ON THE NASAL GANGLION

By
HARRY MEYERSBURG, M. D.
BROOKLYN

Extracted from Archives of Otolaryngology, Vol. 5, No. 5, May, 1927

Symptoms referable to the nasal ganglion are varied and depend on pathologic changes which are little understood. They are manifestations of a morbid state either in the sphenopalatine ganglion itself or in some part of the sympathetic system, the ramifications of which enter the substance of the ganglion or form a network around it.

Many of the ancient textbooks and monographs refer to the neurotic origin of excessive sneezing—rhinorrhea, lacrimation and other symptoms observed in rose-cold, hay-fever and allied conditions; but it remained for Sluder to work out the problems associated with sphenopalatine disease. His description of the anatomy of the nasal ganglion and the bony recess in which it is located, established clearly why the so-called neuralgic syndrome may be the result of extension of inflammation from the paranasal sinuses.

The effectiveness of any therapeutic surface agent applied to the region of Meckel's ganglion will depend on two factors: first, the constancy of the anatomic arrangement of the ganglion and that of the sphenomaxillary recess; second, the depth of penetration of the agent thus applied. The ganglion may lie in close relation to the nasal mucous membrane, or it may be from 8 to 9 mm. external to it.

When one stops to consider how little the rays of quartz light actually penetrate, then one can begin to appreciate that failures must occur in some cases. The interposition of a fat layer will, in my estimation, materially reduce the effectiveness of ultraviolet light. Since this work was begun there have been but two outstanding failures in a group of patients with rose-cold and hay-fever, and these were in obese persons.

As a matter of convenience, cases of nasal ganglion neuritis may be classified in three general groups: (1) painful or sensory, (2) painless or secretory and (3) a combination of the first and second groups. In the first group are to be found those referred to by Sluder as cases of painful syndrome. In the second group have been included all cases of rose-cold, hay-fever and idopathic rhinorrhea. This is the group referred to by Sluder under the heading of sympathetic syndrome. A few patients under my observation complained of secretory disturbance followed or accompanied by pain, pupillary changes and other symptoms. These have been placed in a distinct group. In addition to these types, a few cases of asthma following hay-fever also have been seen which were influenced favorably by exposure to filtered quartz light.

In some of the cases reported herewith, itching and lacrimation alone were reduced at first, in other sneezing disappeared before the subsidence of the eye symptoms.

In the treatment of all patients up to the present, the application of epinephrine hydrochloride was purposely avoided to eliminate the possible contribution of any added benefit from this preparation. While many of the patients had received general and special treatment prior to application of the ultraviolet light, all such treatments and injections were discontinued at the beginning of the quartz light treatments.

There is nothing new about the nasal application of ultraviolet light in cases of rhinorrhea and hay-fever.

During my visit to A. J. Cemach's clinic in Vienna in the summer of 1923, twenty-seven patients were treated by this method, and twenty-two, or 81 per cent,

were materially benefitted. His technic consisted of the introduction of a narrow, round quartz rod, smooth at its distal end. This was screened by a uviol glass (blue) filter and the applicator withdrawn fractionally, exposing the whole nasal mucosa on both sides for a period of about twelve minutes (total radiation). The patients were prepared previously with topical application of epinephine, 1:5,000, and cocaine, 20 per cent. When asked the reason for the striking improvement of the patients following quartz light radiation, Cemach frankly admitted that he did not know at the time.

These observations aroused my curiosity which, up to this time, had been only partly satisfied. The benefit to the patient could not be attributed to a general constitutional change, because the limited action of the ultraviolet light over so small an area could hardly influence the chemistry of the blood stream. The only other probability in my mind was the effect on a nerve ganglion closely associated with sympathetic filaments.

This work was begun in 1924 by exposing only the nasal gonglion region to the filtered light of the Kromayer lamp. The apparatus then in vogue in this country was not designed for accurate intranasa manipulation, but the new self-contained unit is admirably adapted to the work of the rhinologist. The method of filtration of only a few years ago was crude and impracticable. This has since been modified so that today the ultraviolet spectrum can be changed at will without any loss of time or discomfort to the patient.

AUTHOR'S TECHNIC

The patient is required to sit upright during the treatments. No refinement in the way of a special chair with head-rest has been designed. An ordinary straight back chair against the wall with a pillow back of the patient's head has been used.

Color Filtration. — Considerable time and effort has been spent in the perfection of a satisfactory method of color filtration. This was accomplished in the following manner: The regular adapter was modified by placing a slit in such a position that a uviol glass filter could be interposed between the proximal end of the quartz applicator and the window of the Kromayer lamp. While the spectrum obtained seemed satisfactory as to quality, the intensity (quantity) of the light coming through the applicator was questioned. I then suggested variations in filtration to determine just which part of the ultraviolet spectrum was responsible for the best clinical results. At my insistence, genuine quartz capsule liquid color filters were developed. For practical application five different dilutions of watery solution of copper sulphate in flat quartz containers and one dilution of cupric amine sulphate are used, all hermetically sealed to prevent deterioration and color change.

Applicators.—Interest was next directed to the development of proper applicators designed to reach the nasal ganglion with the least discomfort to the patients, so many of whom were found to have more or less septal deviation and turbinate hypertrophy. A flat straight applicator was found to be best adapted to all cases. Two sizes can be employed, according to the available space in the nasal chamber. Bent applicators are avoided to prevent dissipation of valuable rays in the postnasal space. In the latest type of applicator the distal end is blown with air bubbles to increase radiation.

There is no constant visible change in the nasal mucosa immediately following quartz light application. As some of the benefit obtained is subjective, each patient was requested to keep a sort of diary concerning his or her own case. My records are made up mostly from such notes submitted by the patients, supplemented, of course, by additional data, the result of personal observation.

Examination of the Patient.—Each patient was thoroughly examined and the diagnosis established before treatments were instituted. Special attention was directed to the condition of the sinuses and the teeth. This is particularly important in the painful cases; a patient was not treated until the dental and sinus conditions were entirely eliminated. A few patients whose cases were classified in the

secretory group were treated, despite the presence of polypoid degeneration and sinus disease. Almost complete failure followed quartz light exposure in these patients.

Preparation.—The standard preparation of a 1 per cent solution of cocaine was adopted for the nasal spray and a 5 per cent solution for topical application in the lower meatus only. The quartz applicator was introduced beyond the nasal cavity, not under vision, with the patient sitting upright in a straight back chair, the head against a cushion. The lamp was previously operated for about five minutes to insure proper voltage. It was now brought to the level of the proximal end of the applicator and the applicator engaged in the adapter, in which the desired filter had been introduced. The average exposure on each side was 6½ minutes; the average interval between exposures, four days, and the average number of exposures, four.

The Spectrum.—The spectrum of the mercury vapor arc consists of rays varying from about 1,850 to 8,000 angstrom units (from 185 to 800 millimicrons). Wave lengths shorter than 2,300 angstrom units are irritating and are not of any special therapeutic value; those longer than 4,400 angstrom units are known as the visible rays. These have little value in the work. The object of filtering the light, therefore, is to eliminate both ends of the mercury vapor spectrum. The liquid-filled quartz capsules and uviol glass do this satisfactorily, and the spectograms show exactly which rays are utilized when a certain filter is applied. This makes for accurate dosage in wave lengths and allows free exposure of tissues with the positive assurance that a harmful local reaction can not possibly follow even prolonged exposure.

Filtration is essential in applications to the mucous surface in and behind the nose because of unavioidable compression of the delicate membrane by the applicator. It is a recognized fact that compression of any tissue in the application of white quartz light soon results in the destruction of that tissue. This is taken advantage of in the treatment of certain pathologic lesions where such action is desirable.

CONCLUSIONS

1. Filtered mercury vapor quartz light properly applied is followed by relief from symptoms in many cases of secretory and sensory disturbances of the nasal ganglion.
2. The effects thus obtained are not permanent in the seasonal secretory cases.
3. A tolerance to ultraviolet light is developed in the mucous membrane as in the skin. Too many treatments and too long exposures are to be avoided.
4. Straight flat applicators are best adapted to the need of the rhinologist.
5. Unfiltered light must be employed with care, and only by one acquainted with the physical action of such light on tissues. Here the personal equation is to be considered (weight, complexion, previous exposure, etc.).
6. A few patients with asthma following hay-fever were definitely relieved by filtered quartz light.
7. For routine work, a dilute solution of epinephine hydrochloride, or a substitute (antipyrin solution) will enhance the effectiveness of quartz light by reducing the local blood supply.

EXTRACTS FROM TEXT BOOK OF UROLOGY

By

OSWALD SWINNEY LOWSLEY, A.B., M.D., F.A.C.S. *and* THOMAS JOSEPH KIRWIN, Ph.C., B.S., M.A., M.D.

Published by Lea & Febiger

CHAPTER VI. THE SCROTUM—Page 208)"ROENTGEN-RAY, ULTRA-VIOLET RAY, ETC.—In many skin affections as manifested upon the scrotum, such as eczema, erythema intertrigo and puritus, roentgenological treatment has proved very effective, and ultraviolet rays have also been used in these conditions. Of late years the use of the Alpine light has become very effective in treating sluggish wounds of the scrotum, more particularly those of tuberculous origin.").

CHAPTER XI. THE PROSTATE—

Page 466 ("ULTRA-VIOLET RAY OR QUARTZ LIGHT THERAPY.—Use of the ultra-violet ray or quartz-light therapy has proved of great benefit to certain peculiarly obstinate cases of chronic prostatitis, and other diseased conditions of the gland. Ultra-violet ray therapy, is called a powerful and prompt remedy for clearing up obstinate prostatic cases before the period of sclerotis enlargement changes has set in. The patient stands with the body bent at right angles. The prostaic applicator, moistened with soap suds is gently inserted into the rectum with an upward tilt until the resistance of the gland is encountered. The patient will usually complain of subjective discomfort and a desire to urinate. The first dose is of three minutes on the first rheostat button. Usually the reaction of tenderness and congestion subsides in a day or two. The dosage is repeated at intervals of three to five days, being gradually increased up to fifteen minutes and second speed rheostat buttons. The tenderness and "bogginess" should gradually subside. The rectum must, of course, be free from fecal material, otherwise no actinic light can reach the tissues toward which it is directed. The marked stimulation of the rectal mucosa usually produces a slight show of blood at the next defecation. The patient should be warned of this, and it should be explained to him that it does no harm. But if the blood persists and much is in evidence, it will be best to stop treatment until all signs of it have disappeared.").

CHAPTER XIV. THE KIDNEY.—

Page 663 ("Drainage—The healing of tuberculous sinuses sometimes seen after nephrectomy, is found to be remarkably stimulated by the judicious use of the Alpine light. In the series of cases now under treatment by the authors at the James Buchanan Brady Foundation for Urology of the New York Hospital, very rapid cure of long-standing disease has repeatedly been brought about by this simple but effective form of therapy.").

CASUAL AND UNEXPECTED CURES OF SUPPOSEDLY INCURABLE SKIN DISEASES

By EDWARD A. BLOUNT, M. D.,

Extracted from Southern Medical Journal, May, 1927

W. came to see me with pronounced psoriasis everywhere between his ankles and his clavicle. He had been treated by various practitioners for fifteen years. The disease on the backs of his hands was particularly noticeable and annoying to this man who was a piano player and a bridge player. I began giving him intravenously twenty grains of sodium salicylate daily. Externally I used what I have been told is an old army prescription. It is an heroic one and it takes a good soldier or a desperate patient to bear it. The prescription consists of lactic acid, acetic acid, salicylic acid and liquor formaldehydi each three drachms, bichloride of mercury four grains in alcohol up to eight ounce. The patient had tried x-rays without relief and so, on the backs of the hands, I began using the ultraviolet light up to the erythema limit every other day. In two months the hands were well and only a few patches remained on the dorsal aspect of the trunk. A few weeks of quartz light therapy cured these. Recurrences have been slight and easily handled.

ACTINO-THERAPY AND ITS APPLICATION TO PEDIATRICS

FREDERIC W. SCHULTZ, M. D.

Extracted from Minnesota Medicine, Vol. X, No. 6, June, 1927.

The use of the quartz lamp is generally much less likely to cause untoward symptoms and will give better results in pulmonary tuberculosis than helotherapy. On the whole, the results with light therapy in pulmonary suberculosis are really very good. Under its influecne cough and expectoration often lessen decidedly. Pronounced anorexia disappears or is lessened. The weight increases and the general well-being of the child improves. Brunette children do better than blonde or those with red hair, and the well nourished better than the emaciated.

There are some non-tubrerculous and

non-surgical conditions in which light treatment gives very good results. Its beneficial effect in tetany and rickets is definite and striking. It is a valuable aid in the treatment of the anemic asthenic type of child and in the case convalescing slowly from chronic disease. It is helpful in protracted forms of chorea and in chronic non-surgical forms of arthritis. These conditions improve rapidly under its influence.

Whether the choice should be heliotherapy or quartz lamp depends somewhat upon the condition to be treated. In purely pulmonary tuberculosis, the quartz lamp is generally more useful. In surgical tuberculosis sunlight is probably more effectual. In very superficial lesions, however, and in skin lesions generally, with or without suppuration, the artificial sources of light are a better choice. Diseases of the bones and joints, tuberculosis of the peritoneum and intestine and phlyctenular ulceration of the eyes do better, on the whole, with artificial light therapy than sunlight.

PREMATURE INFANTS: A REPORT OF TWO HUNDRED AND SIXTY-SIX CASES

DRS. JULIUS HESS *and* I. M. CHAMBERLAIN

Extracted from Am. Jour. of Dis. of Children Vol. 33, No. 6, June, 1927

The special station for premature infants at the Sarah Morris Hospital for Children of the Michael Reese Hospital has a capacity for the care of twenty infants. There are three rooms, one of which is devoted to normal infants, one to infected infants and the third to infants being prepared for removal to their homes.

So far as is practical, the hospital sends its small, electrically heated hand ambulance with an intern and nurse to bring the infant to the station. By so doing it avoids refrigeration, to a large extent, which is one of the chief causes of high mortality.

The equipment is simple, consisting of individual electrically heated water-jacketed beds, heated dressing tables, hygrometer, high and low temperature reading thermometer, quartz lamp and time clock.

Human milk is the diet used for all infants during the first days or weeks in the department, as their needs may indicate.

The station is under the care of a graduate nurse, who has under her direction the needed number of women trained for this special work, together with some nurses in training who may elect this special service.

In each instance, the mother is encouraged through the efforts of the social service department to keep up her supply of breast milk.

In preparation for return to their homes, the social service department visits the infants' homes at regular intervals for the purpose of instructing the mother in the preparation of feedings and the required hygienic care of the infants.

A special clinic for the graduated infants is conducted at the hospital for the ones who are likely to be neglected in their homes unless properly supervised. We believe that this later follow-up is to be ranked as of equal importance with the hospital care of the infant if good physical development is to be attained.

The station has had a steady growth since it was opened in 1922. During its first year, nineteen infants were received; in 1923, twenty-eight; in 1924, forty-seven; in 1925, sixty-six, and in 1926, 106.

In our series of 266 cases, 138, or 51.9 per cent were discharged from the hospital, in most instances directly to their homes. Excluding the fifty-four infants who died in the first twenty-four hours, 66.9 per cent survived. Immaturity, refrigeration and neglect were the common causes of death in those dying in the first twenty-four hours.

Autopsies were performed in seventy-nine cases. Bronchopneumonia, with and without atelectasis, was present in a large number of the fatal cases. Intracranial hemmorrhage was found in thirty-one of the sixty-nine cases in which the skull was opened. Several other cases showed positive evidence of intracranial hemorrhage, which, however, was not proved by autopsy.

We have had no cases of cerebral hemorrhage without a history of cyanosis at some time or other.

During the past year Wassermann tests have been made on at least one parent of every infant admitted. During 1926, positive eactions did not average more than 10 per cent of all infants surviving more than twenty-four hours.

Multiple pregnancy (49 of 160 infants in the first year) was the most common single cause of premature labor. Many showed evidence of impaired vitality. Two of the forty-nine were from a triple pregnancy.

Approximately one-seventh of the body weight of fluids and human milk of a food value of 70 calories per kilogram every twenty-four hours are required to maintain life. Little can be expected in the way of increase in weight until 90 calories are reached, and depending on the infants' weight, body surface and physiologic development, their later needs will approximate from 100 to 140 calories per kilogram of body weight. In exceptional cases, it may be necessary to feed breast milk in amounts equaling 160 to 200 calories per kilogram. Such infants are usually markedly underweight for their fetal age.

Other dietetic requirements are orange juice feeding which should be instituted by the third week, to counteract the effects of boiling and cod liver oil by the fourth week. To counteract the low iron contet of these diets, egg yolk and carbonate of iron or citrate of iron and ammonia should be started by the fourth week. More recently, we have added yolk of raw egg to the breast milk to meet the iron requirement of the infants.

The infants are fed at the breast on leaving the station, when the mother has been able to keep her supply of milk. Complementary feedings may be necessary. Chymogen milk mixtures, or cultured lactic acid milk mixtures are used; these are usually started before the infants leave the station. Usually in the artificially fed, we have continued the Chymogen feedings throughout the first year. Some of the larger infants are changed to simple milk, water and sugar mixture before this time.

While many of the infants show minor, and a few moderate, degrees of rickets, only a small number have developed marked manifestations. We believe this to be due to the fact that cod liver oil and quartz light therapy were introduced when the infants were 2 or 3 weeks of age. We have had no cases of rickets requiring mechanical appliances or surgical intervention to correct deformities.

Megacephalus, while occasionally seen, disappears early, due, we think, to the early addition of cod liver oil to the diet together with daily exposure to the ultraviolet ray. Active signs of tetany did not develop in any of the infants of our series.

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PRINTED IN U.S.A.

The Quartz Lamp

Ultraviolet Light—Quartz Light Therapy *Published by Alpine Press Inc.*

VOL. 5, NO. VIII AUGUST 15, 1927 ISSUED MONTHLY

Contents

THE QUARTZ LAMP

Copyright 1927
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U.S.A.
Issued fifteenth of each month One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO., NEWARK, N. J., U.S.A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
Slough, Bucks, England
NIPPON HANOVIA SEKIEI-TO KABUSHIKI,
Kaisha, Tokyo, Japan
QUARZLAMPEN GESELLSCHAFT, m. b. H.,
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NEWARK, N. J., AUGUST 15, 1927

THE ULTRAVIOLET RAY IN UROLOGY

GEORGE P. BEUTEL, M.D.
LOUISVILLE, KY.

Extracted from The Urologic and Cutaneous Review, March, 1927, Vol. 31, No. 3

Ever since the advent of heliotherapy upon the horizon of remedial possibilities, hundreds of contributions to the subject of light therapy have appeared in the literature. More recently considerable emphasis has been placed upon the efficacy of somewhat similar rays artificially produced in the treatment of various maladies affficting humankind, and many types of apparatus have been devised for the production, control and safe application of light therapy. In this paper I shall refer only to the ultraviolet radiation emanating from the mercury vacuum quartz lamp, that being the only kind of light production apparatus I have employed as a therapeutic measure. The mechanism of the quartz lamp, the attachments, intensifiers, etc., have been sufficiently described and need no further elaboration.

According to Felts, ultraviolet radiation has been such a constant factor in life processes throughout all times that it may appear like an anachronism to speak of it as the peculiar asset of modern science . . . However, we are compelled to accept these actinic rays as the child of modern science, because modern science was necessary to detect their presence; and only through modern science has it been possible to achieve their full usefulness in photography, experimental chemistry, and the curing of disease. It was the painstaking efforts of modern science that demonstrated the chemical activity of this part of the solar spectrum in respect to the longer rays. Engineering skill then developed the mercury quartz burner, the only means by which an intense radiation can be produced that is characteristically ultraviolet in its effects. Without the invention of such an artificial source of ultraviolet light, the distinctive action of these rays in the prevention and cure of human ills could scarcely have been established, as there is no other source of light that produces such a large proportion of short wave lengths in its radiations. Some, who still cling to the antiquated and primitive method of utilizing natural solar energy as a source of light for therapeutic purposes, have come to recognize the variable and frequently inconsequential degree of ultraviolet light that penetrates the lower atmosphere . . . When the skin of living creatures is exposed to ultraviolet radiations the normal bactericidal power of the blood may be considerably affected. When the radiation is such that only a mild erythema is produced, *i. e.,* one that disappears in about twenty-four hours, the power of blood to kill bacteria is increased sixty-five per cent in the case of rabbits and about twenty per cent in the case of man. An excessive exposure to ultraviolet instead of increasing the toxicity of the blood to bacteria produces the opposite effect. In order to obtain the desired results, however, it is absolutely essential to produce an erythema. The effect on the blood is noticed about two hours after exposure and appears to be due to some change in the corpuscles themselves. (Felts).

Sonne claims that the effective principles of light therapy are not only the visible rays but also the invisible ultraviolet rays. Treatment with the ultraviolet rays is only a form of heat treatment. With the exception of two doubtlessly specific effects of light, viz., the killing of bacteria and the production of erythema, we know very little regarding the mechanism of the effect of light in treatment. (Sonne).

In the opinion of Wyman the quartz lamp can be used as a substitute for sunlight, and has the advantage of being available regardless of sunshine and weather. There is, however, a very real danger of becoming too enthusiastic about ultraviolet therapy lest this form of treatment be looked on by the physician and his patient as a quick and sure cure for all ailments. (Wyman).

Current literature contains meager information concerning the ultraviolet light in urologic practice. The method has occasionally been employed with apparent success in the treatment of chronic urethritis, also in epididymitis and salpingitis of Neisserian origin, and in tuberculosis urogenital lesions. It is far from my intention to recommend ultraviolet radiation as a general panacea for the numerous disorders of varied character the urologist is called upon to treat, but merely to direct attention to certain conditions in which it has proved of value. Doubtless further experience will demonstrate the amenability of other urologic affections to this form of therapy.

Recent researches have shown pruritus vulvae disease to be of bacterial origin. Formerly we employed all kinds of ointments and washes, including phenol, silver nitrate, potassium permanganate, mercuric chloride, also prolonged hot water applications and numerous medicated salves, without alleviating the intolerable itching. Surgical measures likewise proved unsuccessful, and such as multiple scarifications, dividing the sensory nerves to the affected parts, ablation of the external genitals, etc. After the operative wounds had healed the itching returned. The utilization of alcoholic solutions of iodine by cataphoresis produced only temporary relief. It is recognized that in cases of moderate itching some degree of alleviation may be secured by any one of several methods of treatment, but typical pruritus is a serious malady dreaded alike by the victim and the physician. Sufferers of long duration have not infrequently become drug addicts. Women, especially, become so nervous and depressed from loss of sleep that they think of terminating their existence.

In males, the anal, perineal and at times the scrotal regions are affected. These localities become indurated, thickened and excoriated from constant scratching and present a gray foul-smelling surface which it is impossible to keep clean.

In women the disease seems to be limited to the genital regions, including the perineum, the labia majora and minora. The clitoris and adjacent mucous surfaces become swollen from scratching and rubbing until they are several times normal in size.

There are systematic conditions which may cause cutaneous itching that may be confused with true pruritus, such as hepatic disease, renal lesions, glycosuria, etc. Itching may be an anaphylatic phenomenon from hypersensitiveness of the individual to some particular articles of diet. These types, and also the itching produced by hemorrhoids, anorectal fissures, fistulae, worms, pediculi, rectal polypi, varicosities of the rectal veins, so-called "itching piles," etc., do not represent true pruritus.

METHOD OF TREATMENT:

The hair is closely clipped or shaved, the parts thoroughly washed with soap and water, then dried and all crusts removed. The cutaneous folds are gently separated, the surrounding healthy skin protected, and ultraviolet radiation with quartz lamp applied. To avoid overtreatment the patient's natural resistance should first be determined, therefore in the beginning the lamp is held six inches from the parts being treated with duration of exposure five minutes. If only moderate reaction occurs the time of exposure is increased from one to three minutes at each subsequent treatment the distance remaining the same. Three treatments are given the first week, two the second, and thereafter one each week. Twelve to fifteen exposures will afford permanent relief. After the first treatment the nerve endings become soothed and the itching subsides. In all cases of pruritus vulvae it is my custom to give at least four general body radiations for the tonic effect.

I have treated several patients for ob-

stinate pruritus vulvae in accordance with the foregoing method with excellent results. Two cases are now being treated in which satisfactory progress is being made.

Herpes Preputialis: Four patients with herpes preputialis were cured by three applications of ultraviolet light with intensifier, distance two inches, duration of each exposure five minutes. We know that as a rule herpes progenitalis requires little treatment except cleanliness, but in some cases after rupture of the vesicles infection occurs and the course is sometimes prolonged. These cases seem especially amenable to ultraviolet therapy.

Chancre: In my opinion chancre should not be exposed to the ultraviolet rays. As an experiment the method was tried in one case and as a result the diagnosis was delayed because of destruction of the spirochaeta pallida.

Inguinal Adenitis: Before I purchased a quartz lamp one patient with unilateral inguinal adenitis was referred to Dr. Charles W. Jefferson, Louisville, for ultraviolet therapy. The inguinal gland was enlarged, inflamed and sensitive to palpation. After two treatments it became soft and was then lanced and curetted. One additional light treatment was given and the wound healed without dressings. Since that time I have had under observation on numerous similar cases in which after two or more applications of the ultraviolet light the enlarged glands disappeared without operation.

Epididymitis: Ten patients with left-sided epididymitis, the epididymes being greatly enlarged and tender, were cured by three applications of the ultraviolet light, distance four inches, duration of exposure five minutes. Before beginning treatment the parts were painted with tincture of aconite and iodine equal parts.

Vulvitis: Vulvar inflammation is frequently noted in young married women. I have treated four patients of this type very successfully with ultraviolet therapy. One case in particular was quite severe, localized abscess formation being imminent. Ultraviolet light with intensifier, distance two inches, three treatments, time five minutes each, effected a cure in each instance.

ULTRA-VIOLET IRRADIATION IN GANGRENE

By PAUL BOUSFIELD, M. R. C. S. ENG., Late Physician to the London Neurological Clinc, Ministry of Pensions.

Extracted from The Lancet, May 14, 1927.

The following case has interesting features:

The patient was a woman aged 92. Her regular physician had been called in on account of a subacute attack of bronchitis, but on examining her back he found two large patches of dry brown gangrene which involved the skin and superficial fascia. Round the edges of the gangrenous patches, which had been retracted, there was about a quarter of an inch from which was oozing blood and a small amount of pus. One of the patches of gangrene was over the right scapula; it was oval in shape and had an area of about 15 sq. in. After the slough was removed the depth of this lesion was about an eighth of an inch. The other patch was over the posterior aspect of the head of the right humerus, and was about 4 sq. in. in area; after the slough had been removed the wound was a quarter of an inch in depth. There was also an oozing bedsore with an area of 2 sq. in. over the upper part of the sacrum.

The history of the gangrenous patches was interesting. The old lady had been in the habit of sitting upright in a chair with a stiff, high, wooden back, against which she leaned on her right side for hours at a time in order to look out of the window. The pressure had evidently occluded the blood-vessels in the gangrenous areas.

Her condition was aggravated by renal insufficiency and cystitis of some years' standing, and her physician naturally took a very grave view of the case. Knowing the effect of ultra-violet irradiation on small ulcers he asked me if it was likely to be of any use in this case. I consented to test its effect, though I hardly considered in such a patient that it was likely to be completely successful. The gangrenous sloughs were first removed by repeated fomentation and with the help of scissors and forceps, with the result that the two raw excavated surfaces, described above, were left bare. I then proceeded with the irradiation.

I began with a dose from the open arc at a distance of 3 ft. for a quarter of an hour, irradiating the whole back, but using a concave mirror so as to focus radiant heat directly upon the open wounds. The same dose was repeated in 48 hours, and thereafter was gradually increased up to 20 minutes, and the arc brought to within 18 in. of the wound. After the first two treatments the pus had disappeared. After four—i. e., at the end of ten days—new skin had formed half an inch all round the larger wound, and both wounds were covered with healthy granulations. The oozing of blood, which had been continuous at first, had also completely ceased. After eight treatments—i. e., three weeks—the large wound was entirely covered with skin except for a small patch about the size of a sixpence in the centre, and the small wound had developed about half an inch of skin round the margin. Granulations in the centre of this wound were proliferating too fast and had to be touched with copper sulphate. At the end of about six weeks both wounds were completely covered with healthy skin, and the bedsore over the sacrum, which had also been treated, was completely healed.

A noteworthy side-issue was the great improvement in the general condition of the patient. When first seen, and for a month or so previously, she had been in a dazed and sometimes rather comatose condition; at the end of the treatment she was bright, cheerful, and intelligent.

The case is particularly interesting in that it suggests that bedsores in old people, which so frequently usher in the terminal event where bad nursing has preceded the physician's arrival, may now be more amenable to treatment.

THE ACTION OF THE ULTRA-VIOLET LIGHT ON EXPERIMENTAL VACCINATION

P. CARNOT, L. CAMUS *and* H. BENHARD, *Paris med.* 51:506 (*Dec.* 18) 1926.

Rabbits were inoculated with vaccine in which the skin reaction time had been established by controls. Part of the area of vaccination were covered with an aluminum shield and the whole exposed to a mercury vapor lamp to the point of erythema. There was no reaction in the skin surface exposed, while that shielded gave the characteristic one. The authors therefore conclude that irradiation of short wave length cause modifications in the skin so that a local state of immunity results. They believe that this may have a practical application in the treatment of smallpox.

IRRADIATED MILK

Extracted from Jour. A. M. A., July 2, 1927.

The newly discovered power of ultraviolet rays to confer antirachitic properties on various types of food is so astounding that the scientific world has scarcely recovered from the surprise and elation that followed the first announcements. The possibility, reported in a recent issue of THE JOURNAL, of making a few milligrams of an isolated organic substance acquire, through exposure to suitable brief irradiation, an antirachitic potency equivalent to that of an entire quart of good cod liver oil fires the imagination and inspires an increased respect for the importance of "little things" in nutrition. Ultraviolet rays are, however, not to be regarded merely as a sort of plaything in the hands of untutored persons; nor should they become a tool for quacks. In a warning against wholesale or hasty irradiation of foods it was pointed out that undue exposure to ultraviolet rays may actually produce deterioration in foods, so that great caution and expertness must be used in securing the desired beneficial results. Such warnings should not be allowed, however, to obscure or minimize the successful endeavors. In 1925, a group of investigators at the University of Wisconsin demonstrated that, by exposure to the radiations of a quartz mercury vapor lamp, the antirachitic properties of cow's milk were increased eight or more times. This increase in activity can also be induced rather promptly, though to a lesser degree, by direct irradiation of the animal. Sup-

plee and Dow have recently demonstrated a comparable effect on dried milk, to which irradiation imparts measurably greater antirachitic and calcifying properties; and this is true not only for winter-produced milk, which is usually comparatively poor in antirachitic potency, but also for milk produced under the better natural conditions that prevail in summer. The potential capacity of milk for calcifying properties is not fully attained under the natural conditions of production. Apparently the utilizable increment of antirachitic potency imparted to winter-produced milk by irradiation is greater than the utilizable increment imparted to the summer product. The results of Supplee and Dow appear thus to confirm the existence of a significant interdependence between antirachitic properties and the degree of ultraviolet radiation to which the product itself, or its synthesizing agent, the body of the cow, has been exposed. These advantages of irradiation can be secured, under proper conditions of treatment involving only a brief exposure to ultraviolet rays, without impairment of the other nutritive properties of the milk.

THE ANTIRACHITIC ACTIVITY OF MONOCHROMATIC AND REGIONAL ULTRAVIOLET RADIATIONS

ALFRED F. HESS *and* MILDRED WEINSTOCK

Extracted from Proc. Soc. for Experimental Biology and Medicine
Vol. XXLV, May, 1927, *No.* 8

In a communication published some years ago it was shown that ultra-violet rays longer than about 324μμ exert no antirachitic potency, and that waves 302μμ are of great value in this respect. Somewhat later we suggested, as the results of experiments with selective filters, "that the intense line of the mercury vapor spectrum 302μμ in length conferred definite protection and that the 313μμ waves exerted probably a feeble action in this respect." The question as to whether antirachitic potency ceases at the 313μμ or the 302μμ level is of both theoretical and clinical importance, as the shorter rays are present to but a small extent and in low intensity in the solar radiations which reach the surface of the earth. This is especially the case where the rays are intercepted by moisture or smoke. It, therefore, seemed worth while to make a more minute dissection of the spectrum in this region. This has been accomplished by means of the isolation of these two lines of the mercury vapor spectrum and testing their power to activate cholesterol. The radiations were of equal intensity, and the same amount (2.5 mg. per capita daily) of the irradiated cholesterol were fed to rats which had been rendered rachitic. Without going into detail at this time, it may be stated that a series of experiments of this nature showed that the 302μμ line possessed marked antirachitic potency, whereas the 313μμ line exerted very slight specific power. This result emphasizes more strongly than ever the remarkable specificity of wave lengths of light in relation to rickets.

It has never been accurately determined whether radiations less than 290μμ, the shortest emitted by the sun, have curative power in rickets. About two years ago the shorter ultra-violet waves were segregated from the longer radiations by means of a filter containing chlorine and bromine, which, however, allowed the passage of about 0.1 per cent of radiations between 290μμ and the visible blue. Recently we were able to isolate two bands of radiations given off by the mercury-vapor lamp—those less than 290μμ in length and those between 290μμ and 313μμ. Their antirachitic activity was tested directly by irradiating rachitic rats. It was found that radiations shorter than 290μμ, in other words shorter than those produced by the sun, exert a more intense antirachitic effect than the most potent region of the solar spectrum. This result is in accordance with clinical experience.

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garding sun baths. One is that the children who take them have a sense of well being. You hear of posture methods being taught to make children hold themselves erect. These little fellows, if they have been taking the treatment long enough, have such a sense of well being that they hold themselves as straight as little Indians. The mothers comment upon the improved posture after a few months of this treatment.

Among many other results the freedom from disease of these children should be noted. If one were commercially minded, as physicians are sometimes said to be, he would wait until he had accumulated a good bank account before he urged his patients to take up the sun bath treatments the year round, because it will reduce his practice at least one-third.

I want to point out one thing, which I think is of decided value. All over the Country is being studied the incidence of colds, head coldts, or whatever term you use for infections of the upper respiratory tract. It seems to me that sun baths are going to be one of the valuable contributions to the solution of this problem. As to how it works I am not prepared to say. Whether merely getting these children out of doors reduces the exposure to other cases, whether the building up of the system increases their resistance, or both, or whether there is some virtue that has not been discovered in the sun and air, I do not know. Of course, we know that in warm rooms the mucous membrane tends to become congested. The fact remains that these fresh-air children have fewer respiratory infections than do the others. But I would emphasize the importance of getting them in both the sun and the air if the best results are to be secured.

IRRADIATED FOODS AND IRRADIATED ERGOSTEROL

By K. Blunt, Ph.D. & R. Cowan, S.M.

Extracted J. A. M. A., Oct. 26, 1929.

The foods which have been successfully irradiated include a long list: numerous oil and fats—olive, cottonseed, linseed, corn and cocoanut oils, lard, oleomargarine and butter, but not liquid petrolatum; cereal products—refined wheat flour, whole wheat flour, shredded wheat, cream of wheat, oatmeal, cornmeal, cornstarch; meat; milk, whole or dry; various vegetables; orange juice. The potency of egg yolk was increased from ten to twenty times. Sugar is almost the only natural food for which attempted irradiation has been unsuccessful; rancid oils, too, can not be activated, apparently because the activatable substance is destroyed during the development of the rancidity.

The process consists of exposing the material in a thin layer, often not more than one-eighth inch, at a distance usually of about 2 feet, to the quartz mercury vapor lamp, the food sometimes being passed slowly under the lamp or a series of lamps.

YEAST AND IRRADIATED ERGOSTEROL IN THE TREATMENT OF ACRODYNIA

By S. J. McClendon, M.D.

Extracted from Jour A. M. A., Aug. 10, 1929.

Various observers, Craig and Sweet particularly, have reported success with the use of the quartz light. Ultraviolet therapy is a medium used in various vitamin deficiency diseases, especially in rickets, and the benefit derived from that type of therapy might be attributed to the supplying of the missing vitamins. In the case reported here the irradiated ergosterol may have supplied the same deficiency.

ULTRAVIOLET RADIATION THERAPY IN ERYSIPELAS

By W. H. Ude

Extracted from Radiology, Dec., 1929.

Ude advocates the use of ultraviolet radiation in preference to antitoxin in the treatment of erysipelas. Apparently excellent results are secured with a minimum of danger, discomfort and expense to the patient. Some of the advantages of the treatment are that it is readily available in practically all communities; it requires only one treatment; it is devoid of danger; it is inexpensive; the results are comparable to those of any other method. The technic of treatment is simple. It can be carried out with any ultraviolet lamp, and necessitates only a knowledge of the efficiency of the lamp.

PRINTED IN U.S.A.

The
Quartz Lamp
Ultraviolet Light ~~ Quartz Light Therapy ~~ Published by Alpine Press

VOL. 8, NO. II FEBRUARY 15, 1930

Contents

ISSUED MONTHLY

THE QUARTZ LAMP

Copyright 1930
ALPINE PRESS, INC., Publishers
OFFICE: 80 Chestnut St., Newark, N. J., U. S. A.
Issued fifteenth of each month. One dollar a year.
Copies Supplied For
HANOVIA CHEMICAL & MFG. CO.,
Newark, N. J., U. S. A.
BRITISH HANOVIA QUARTZ LAMP CO., LTD.
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Buenos Aires, Argentine

NEWARK, N. J., FEBRUARY 15, 1930

ULTRA-VIOLET—AND HOW?—AND WHY?

By W. J. RIEDEL, D.D.S.

Extracted from The Dental Digest, Jan. 1930

Ultra-violet is a comparatively recent accessory to the dental armamentarium in the treatment of various conditions. It is so recent, in fact, that authorities contradict radically as to its application. There is still so little known scientifically of its action that there is much conjecture as to its specific reaction. Much room is left in which to theorize as to why varied results are obtained after ultra-violet exposure, but there is no questioning the fact that they do take place.

Some men regarded as authorities say that there is no penetration. Others credit the rays with a penetration of from 1.5 mm. to 4 mm. in living tissue. Some say, "Do not hold the applicator in contact with the tissue under treatment." Then an article or a lecturer states that the tissue under treatment should be exposed under light contact with the applicator or heavier contact if greater penetration is desired, due to the dehematization of the tissue by pressure.

Again we hear that the ultra-violet ray is immediately absorbed by the slightest film of blood, with no further penetration resulting. Yet the same authority will tell us that exposing the alveolus of a tooth that has just been extracted to ultra-violet from six to eight minutes, without introducing the applicator in direct contact with the wall of the socket, will prevent post-operative soreness—and it does. In spite of the fact, the presence of blood renders ultra-violet incapable of further penetration, and I have yet to see a case of ordinary extraction where there was no trace of a blood-containing exudate immediately after the removal of the tooth in question.

Is it any wonder, then, that the man who is just beginning the use of ultra-violet is in a quandary as to what or what not to do? It is my contention that the thing to do is to try the various methods, watch the results, and follow through those that your equipment produces most desirably.

It is really astonishing to what an extent post-operative complications can be averted or greatly minimized by the use of ultra-violet. I might, for example, cite two cases from my practice which are typical of many.

CASE I

I removed a right maxillary second molar for a lady who had been having neuralgic pains in the head for a long period. X-rays showed considerable calcification of the pulp in the pulp chamber. There resulted about two weeks of extreme pain from a dry socket. The patient returned in about four weeks with similar symptoms on the left side. X-rays showed the same condition in the left maxillary second molar. She wanted the tooth removed, but naturally, was very apprehensive about it after her previous experience, and I could give her no encouragement. I removed the tooth, and it gave every indication of a repetition of the actions of the first offender, with all appearances apparently prophetic of dry socket. This time I directed ultra-violet rays into the socket for a period of six minutes. When dismissing the patient, I requested her to call me the following morning and inform me of her condition. The report came in, greatly to my surprise and pleasure as well as the patient's, that she had slept well and the socket had given her no discomfort.

CASE II

The other case in mind was that of a woman, about 38 years old, who had had a very difficult time with septic sockets after the removal of two maxillary third molars about two years before. The teeth had been neglected since that time, making it necessary to remove two other molars. The patient was much worried and had put off the ordeal as long as possible. She was extremely nervous. The teeth were badly broken down, the pulps were vital, and a generally hypersensitive condition was present. Immediately after extraction a four-minute exposure to ultra-violet was given (two minutes less than in the other case), with blood oozing freely. The condition reported by the patient's husband the second morning following, instead of the next day as requested, was that she had slept well and was doing nicely, with very little tenderness present, notwithstanding the fact that I had used more than the usual amount of novocain solution because of the hypersensitive condition.

There are many theories extant as to why and how these conditions are so favorably influenced by ultra-violet. Whether it be activation of phosphorus, calcium metabolism, increase of hemoglobin content in the blood, bactericidal action to the depth of penetration, unknown or known, why not accept the thing as it is for the good it does? Let the investigation of why and how it does it go on at leisure, in the meantime letting it do its part in the alleviation of suffering for the patient and in easing the mind of the operator.

I have a personal theory regarding the operation of ultra-violet, one I have not heard expressed in the same way, at least. It is that ultra-violet exposure in some way stores up potential energy in the cells of the tissue so exposed, which prevents inflammatory reactions throughout the duration of the healing process, whether the tissue be blood, bone or soft tissue. Why should this not be just as tenable as the theory that vegetables store up their vitamins, and that cow's milk during the summer months, when grass and feed acquire greater ultra-violet activation by exposure to the sun or even to artificial irradiation, has been proved to be beneficial to or even capable of curing diseases resulting from lack of this activation?

THE EFFECT OF MERCURY VAPOR LIGHT IRRADIATION UPON THE VASCULAR SYSTEM

By H. H. PERLMAN, M.D.

Extracted from Arch. Phys. Ther., X-Ray & Radium, Dec. 1929

Among medical attendants there are those who are ever eager to condemn light therapy. Curiously enough, many of the physicians who are skeptical in the use of ultraviolet have never employed irradiation, or, having resorted to the use of the rays, are not entitled to judge the merits of artificial heliotherapy from the comparatively few cases studied. Painstaking researches of many eminent physiotherapists in this country and abroad are too valuable to be entirely ignored. There is scarcely a branch of medicine which has not been invaded by ultraviolet. Specificity of the rays has repeatedly been demonstrated in rickets, spasmophilia and tetany. The efforts of Hess, Unger, Pappenheimer, and others are noteworthy in this respect. Hazen has called attention to the value of ultraviolet in pityriasis rosea. Psoriasis sometimes lends itself to the cure from routine exposures to the sun rays.

One marvels at the beneficent results obtained from artificial heliotherapy in treating stubborn cases of herpes zoster. Staphylococcic infections of the skin respond beautifully to short rays of ultraviolet. In the use of mercury vapor quartz light, the therapeutist now has another agent, equally effective as mercurial compounds and gentian violet in the treatment of impetigo.

Chronic bronchitis in the child and adult are remarkably benefited by systemic exposures to ultraviolet. The light has also been serviceable to the surgeon in healing burns and in repairing fractures. The neurologist finds the artificial beams of sunlight valuable as a sedative. Galactogogue properties have been attributed to ultraviolet. If further research

proves irradiations cause an increased flow of milk during and after the puerperium, then one of the greatest usefulness of ultraviolet will have been established, since there are few true galactogogues. In a series of patients studied by Stolte and Wiener, excellent results were obtained in a group of twenty lactating mothers.

Those who believe that ultraviolet has fallen short of its reputed value, and who likewise contend that light rays have not met the expectations of therapeutic idealism, we should like to remind that the zenith of therapeutic idealism has as yet not been achieved through the use of drugs. The tendency at present is unquestionably specificity: that is, fewer drugs of greater therapeutic efficiency. Clinical experience with mercury vapor quartz light has established its wide range of usefulness in a great many disorders not benefited by drugs. Contrary to earlier investigations with ultraviolet therapy, when irradiations were employed very much with the "hit or miss" objective in mind, not unlike the old time polypharmaceutical or "shotgun" prescription, careful research has proven the rationale of ultraviolet. Its use, therefore, has largely replaced empiricism.

Modern physiotherapeutists are now guided by well defined principles, indications and contraindications for the use of artificial heliotherapy. The rays are no longer employed as a panacea. Treatment by quartz light has reached that degree of therapeutic nicety and exactness when many conditions formerly unaffected by standard routine therapeutics can be relieved; and in many instances it can be depended upon to effect a so-called "cure" by routine exposures. It is true that many new fields of research have been entered by the introduction of light therapy. While a great deal remains to be accomplished particularly in regard to the standardization of dosage, ultraviolet light has undoubtedly proven its value both to the physician and chemist.

Physical agents are often more valuable than drugs. This is not because difficulty is encountered in administering remedies by mouth, but for the reason that many drugs are not tolerated during early life. It is a dictum in all therapeutics, never to administer medicinal agents unless there is strong indication for their use. Rest, good food and fresh air constitute the keynote upon which natural immunity and recovery depend. In the young, hydrotherapeutic measures are preferred to antipyretic drugs, although the latter are often found useful when a sedative effect is desired. Physical agents therefore become indispensable to the pediatrician when medicines are administered with difficulty. One of the outstanding features of ultraviolet medication is the tonic effect upon the nervous system. When properly administered to individuals, suffering from malnutrition, there is often a gain in weight. Because of this constructive property, ultraviolet irradiations are sometimes referred to as food rays.

In the treatment of anemias of secondary origin, light therapy possesses many advantages over iron compounds. Several authorities including Langstein (L. Langstein, Deutsche. Med. Wohnschr. Nov. 22, 1928) have deplored the indiscriminate use of liver diet in the treatment of secondary anemia. As far as can be ascertained from the use of liver extract in secondary anemia this therapeutic regime is not only worthless, but as several therapeutists point out, when prescribed for infants liver diet is liable to produce putrefactive diarrhea with loss of appetite and fever.

SCOPE OF STUDY

The study of the effect of the mercury vapor quartz light upon the vascular system was approached from two angles. The first concerned itself with the effect of the light upon the individual blood elements, found in various disordered states for which patients were referred to the department for treatment. The blood counts of all patients selected for this study revealed a secondary anemia.

The second half of the experiment was in a sense an analytical survey to determine the effects upon the blood constituents that followed from short, moderate and prolonged exposures.

The routine practiced for generalized exposures in the Artificial Heliotherapy Division of the Pediatric Department at the Jefferson Hospital consists in irradiating the entire body upon the anterior and posterior aspects for an equal number of minutes. Treatments begin with one minute and are increased in duration on alternate days until a total of fifteen minutes are reached at regular tube distance (40 inches). After the fifteenth exposure, the tube distance is gradually lowered toward the skin surface (one inch at each successive treatment) until the quartz tube measures one foot from the body of the patient. The maximum tube distance is one foot from the body and the maximum exposure under this technic is fifteen minutes anteriorly and posteriorly. This procedure is continued irrespective of the number of exposures patients receive until they are discharged. Excessive tanning of the skin and burns are cautiously guarded against by employing trained technicians who by experience know when to increase and decrease or discontinue irradiations.

The study included 18 infants and 55 older children. Their ages ranged between 2 and 13 years, 41 were males, 32 were females. The following are conditions for which ultraviolet therapy was administered: Malnutrition, 26; chronic bronchitis, 27; infantile rickets, 7; esophageal stenosis, 4; laryngeal stenosis, 3; eczema, one; bronchietasis, one; secondary anemia (cause — intestinal parasites?), one; nephrolithiasis (tonic-effect), one; pylorospasm, one; enterospasm, one. All were white children.

TABLE I.

LARYNGEAL STENOSIS

Total Number Patients—3

	Increased	Decreased	Unchanged
Hemoglobin	2	1	0
Red Blood cells	2	1	0
White Blood cells	2	1	0
Polynuclears	1	2	0
Small Lymphocytes	0	3	0
Large Lymphocytes	2	1	0
Transitionals	0	0	3
Eosinophiles	1	1	1

Three patients, two males and one female, were treated for laryngeal stenosis. The youngest patient was three years, the oldest four years. Results obtained are recorded below.

Hemoglobin—Increased in two patients (minimum 7%, maximum 10%); decreased in one (17%).

Red Blood Cells—Increased in two patients (minimum 100,000, maximum 120,000); decreased in one (300,000).

White Blood Cells—Increased in two patients (minimum 2,000, maximum 6,200); decreased in one (5,400).

Polymorphonuclear Leukocytes—Increased in one patient (18); decreased in two patients (minimum 2, maximum 5).

Small Lymphocytes—Decreased in all three patients, (4, 12 and 30 cells respectively).

Large Lymphocytes—Increased in two patients (each 14 cells); decreased in one (4 cells).

Transitional—These cells were neither increased nor decreased from the light exposures, since the transitional cells were not discovered either before or after irradiations.

Eosinophiles—Increased in one patient (one cell); decreased in one patient (two cells); unchanged in one patient (no cells).

SUMMARY

The hemoglobin, red, white and large lymphocytes cells were each increased in two instances and decreased in one instance. The polynuclears were increased in one patient and decreased in two patients.

The following are the remaining changes observed. Small lymphocytes decreased in three patients, transitionals were unchanged in three instances; eosinophiles increased in one patient; decreased in one patient and remained unchanged in one individual.

CONCLUSION

Mercury vapor quartz light irradiations in three patients treated for secondary anemia, all subjects of laryngeal stenosis, were benefited inasmuch as the hemoglobin, red and white blood cells were concerned. The differential cellular elements were more frequently depressed than stimulated in this group of patients studied.

THE PLACE OF GENERAL ULTRA-VIOLET IRRADIATION IN THE TREATMENT OF WHOOPING COUGH

By L. SHILLITO, M.B., B.Ch.

Extracted from The British Jour of Actino-therapy and Phys., Dec. 1929

The advancement of new claims for light-therapy is met in these days—perhaps rightly—with a healthy scepticism, owing to over-enthusiastic and unsubstantiated claims in the past.

As its application is becoming more scientific and less empirical, the fact is becoming increasingly obvious that ultra-violet light has a definite physiological action, of which use may be made in dealing with one or more of the factors that form the composite condition called a disease. The consideration of its limitations, as well as its use, in the treatment of one disease—pertussis—is one of the objects of this memorandum.

Radiation treatment of pertussis has of course been employed in various ways. In 1924, H. L. Bowditch, of the Boston Floating Hospital, reported (1) good results obtained by the use of X-rays. E. H. and W. K. Russell record cases successfully treated with ultra-violet rays in 1925 (2). W. W. McCraw reported (3) a series of cases of 201 children and 85 adults treated for whooping cough by means of a mercury-vapour lamp, and his results were:

Children, 52% cured, 38% improved, 10% unchanged.

Adults, 80% cured, 20% improved.

(By improvement is meant relief from vomiting and whoop with persistence of paroxysmal cough though in a milder form. Increased appetite and gain of weight were found in 90% of his cases.)

In the early part of last winter I had a series of 17 cases of whooping cough in children, which I treated by general irradiation with a mercury-vapour lamp. The results I obtained, tabulated in similar fashion to the above, were:

Apparent rapid cure.....5
Marked improvement 4
Slow improvement 6
No effect 2

No drugs were given except in one or two of the more severe cases to alleviate excessive sickness. Exposures were daily, varying from one to ten minutes according to age of patient and the stage of treatment. The duration of the latter varied from an average of about ten days to as long as a month.

To consider the benefits resulting from this treatment requires an analysis of the principal symptoms of whooping cough —an essential preliminary, of course, to the synthesis of any rational scheme of treatment. The chief symptoms of the established disease are:

1. *Paroxysmal cough, with inspiratory whoop.*
2. *Vomiting, frequently following the former.*
3. *General malaise and irritability.*
4. *Loss of sleep and weight owing to the cough and sickness.*

The best results were obtained in those cases in which the paroxysmal stage had not been present more than a week. In all the cases the earliest and most noticeable result was an improvement in sleeping. The patients usually had a better night after the first exposure.

Alleviation of the general symptoms of malaise and irritability, with stimulation of appetite, vitality and cheerfulness was observed in all the cases. Most of them increased in weight, whereas in whooping cough a loss of weight is usual.

The remarkable effect it seemed to have in cutting short the cough and sickness in five of these cases, and the marked improvement it brought about in some of the others, shows that ultra-violet therapy is not without its place in the treatment of this disease, though like many other methods of treating pertussis, it exercises its most beneficial effects on the mild rather than the severe cases. As compared with the results obtained by Stewart (4) in treating with ephedrin a picked series of cases in which the disease had not been in progress more than a week, ultra-violet light gives very similar results in alleviating symptoms, with perhaps a better end result so far as general health goes.

Both these methods mark an advance in the treatment of pertussis, their action being possibly similar in effect upon the sympathetic nervous system. But ultra-violet therapy does not preclude the simultaneous use of other agencies dealing with other factors of the disease. It should rather make their use possible and give them a better chance of acting successfully.

VALUE OF INTRANASAL ULTRAVIOLET IRRADIATION AS AN AID IN THE THERAPY OF NASAL ACCESSORY SINUS DISEASES

By R. G. REAVES, M.D.

Extracted from Arc. of Phys. Ther., X-Ray and Radium, Nov. 1929

The first practical step of intranasal ultraviolet irradiation is the preparation of the nose to receive the rays. The nasal mucosa must be clean; the mucosa must be shrunken in order to permit the light to reach as many recesses as possible; it should be anesthetized in order not to hurt the patient. Cocain will anesthetize and shrink the mucosa, but because of its tendency to idiosyncrasy and toxicity, I seldom use it. I have found one-half of one per cent butyn combined with one per cent ephedrin most satisfactory for this purpose. This combination was worked out by the writer in collaboration with the Abbott Laboratories. It has all the advantages of cocain without its ill effects. It is now on the market in this combination and may be prescribed without narcotic blanks.

When the mucosa has been properly prepared for the reception of the rays, the results will then depend largely on the technic of application. I have seen illustrations where the patients were applying the rays themselves. I know of only two conditions where this could be done successfully, namely, in atrophic rhinitis and in postoperative sinus cases where there is plenty of room in the nose. To permit a patient to apply the rays, in the average nose, means that an excess of rays will be applied about the anterior of the middle turbinate and tubercle of the septum, with practically no rays reaching the posterior part of the nose. If the nasal mucosa is anesthetized and shrunken, a suitable applicator can be passed along the floor of the nose to the nasopharynx. It should be slowly withdrawn and played in the nose so as to distribute the rays as thoroughly as possible throughout the nasal cavity. The time required with most lamps is from one to one and one-half minutes. Some of the applicators are rather large for this procedure. The nasal cavity may be small or there may be some anatomical anomalies which will interfere with the irradiation of the nasopharynx, and the posterior ethmoids. In this case, a suitable curved applicator can be passed behind the soft palate. This may be done in many cases without anesthetizing the soft palate. The applications as described will abort most of the common colds, if applied during the first 12 or 24 hours after the onset.

The rays are also of value as an aid in clearing up acute sinus infection. It is usually my custom to use the rays in conjunction with the vacuum irrigation and antrum punctures when necessary. Most acute cases of sinusitis clear up with the proper treatment without an operative procedure, and some clear up with very little treatment.

Mild cases of sinusitis, particularly of the ethmoids, can be greatly benefited by irradiation. This is particularly true in the moderately hypertrophied rhinitis observed in people 50 years or more of age. It has been my custom, in most of these cases, to paint the mucosa with one per cent silver nitrate before applying the rays. This treatment causes the mucosa to become more healthy, lessens the secretion, increases the breathing space, and gives better ventilation to the sinuses. The common expression of the patient is, "My head feels clear". I have found the application of silver nitrate and the rays especially efficacious in hyperesthetic rhinitis.

SUN BATHS FOR CHILDREN

By L. W. ELIAS, M.D.

Extracted from Southern Med. Jour., Nov. 1, 1929.

In the brief time alloted me there are just a few points that I wish to make re-